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LOGISTIC SUPPORT IN THE VIETNAM ERA

MONOGRAPH 3

AUTOMATIC DATA PROCESSING SYSTEMS

A REPORT
BY THE JOINT LOGISTICS REVIEW BOARD

OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE
WASHINGTON, D.C. 20301

18 DEC 1970

SS

INSTALLATIONS AND LOGISTICS

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Paul H Riley

PAUL H. RILEY
Deputy Assistant Secretary of Defense
(Supply, Maintenance & Services)

ERRATA SHEET

Monograph 3, Automatic Data Processing System
A Report by the Joint Logistics Review Board

Make the following changes:

a. Page 9, Par. 2, Last Sentence. Delete and substitute.

"This delayed processing of lower priority requisition to obtain faster service. To solve this problem, the Services upgraded their computer configurations in varying degrees, either through higher capacity central processing units or increases in peripheral equipment."

b. Page 10, Par. 6, First Sentence. Change word support to read supported.

c. Page 16, Par. 3. a. (3), First Sentence. Add the word its preceding the word operation.

d. Page 19, Par. 3. b. (5), Second Sentence. Change the word result to read results.

e. Page 31, Par. 1. a, Third Line. Change the word in-countr to read in-country.

f. Page 33, Par. 2. a. (4), Last Sentence. Add a "/" between the words Services and Defense.

g. Page 33, Par. 2. b. (3), First Line. Add a "/" between the words Services and Defense.

h. Page A-3, Par. 4, Last Sentence on Page. Change the word required to requiring and delete the comma after the word NICP.

i. Page A-8, Par. 12. a. (2) (b) 5 d, Last word in Par. Change spelling of procdures to read procedures.

j. Page D-3, Par. 4. Add the following after the first sentence.

"ADP responsibilities of AFLC have been carried out through the Advanced Logistics Systems Center (ALSC).[5]"

k. Page D-3, Par. 5. Delete the comma and insert a period at the end of the sentence.

l. Page D-6, Par. 16, Fourth Line down. Change the word buys to read buy appearing before the word programs.

m. Page D-7, Par. 17. Delete in its entirity the fourth sentence which reads "This interface insures complete correlation between the buy determining the requirements factors."

n. Page E-3, Par. 6, First Sentence. Change the word random-assess to read random-access.

o. Page E-3, Footnote 1 at bottom of page. Add a line under DSA.

p. Page F-3, Par. 2. a. (1), Last Line. Change the word care to read core.

q. Page F-10, Par. 5. b. (1) (a), Second Line from bottom. Change the word entires to read entries.

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INTRODUCTION

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INTRODUCTION

1. BASIS FOR STUDY

a. The Vietnam conflict greatly expanded the use of Automatic Data Processing (ADP) throughout logistics, causing a significant impact on logistic support during this era.

b. The Terms of Reference of the Joint Logistics Review Board (JLRB) charged the Board to review worldwide logistic support during the Vietnam era, and directed that emphasis be given to the effectiveness and economy of current and planned logistic systems.

c. The Terms specifically mentioned ADP only under Supply Management, but it soon became apparent that ADP is important to other functional areas as well. The importance of ADP to the overall support of logistics warranted its broader treatment in a separate monograph.

d. In view of this, the Board convened an ad hoc group for the preparation of this monograph.

2. SIGNIFICANCE

a. Automatic data processing, as a technology and as a tool in logistic management, predates the Vietnam era by many years, but was not generally utilized in Vietnam during the initial entry of the Services into that country in 1965. Comments of responsible commanders and staff personnel during the JLRB visit to Southeast Asia highlighted problems resulting from the lack of ADP in Vietnam in the early stages of the war, the need for more ADP capability to help manage logistics, the proliferation of systems in being, and the scarcity of trained personnel.

b. The impact of computers on logistics management can be seen in five closely related areas:

(1) Advancing computer technology and expanded computer use

(2) Centralization of systems design, analysis, programming, and computer operation

(3) Standardization of data systems

(4) Systems integration

(5) Functional management participation in the automated system development and design.

c. The computer as a tool of logistic management has contributed significantly to the improvement of material control and support of the operational requirements through the ability of the hardware and associated software to process rapidly and accurately large volumes of data with a minimum of human intervention. Computer usage has also permitted the reassignment of logistic personnel resources to functions requiring human judgment, thereby upgrading the effectiveness of the total logistic support organization.

d. Computer systems with their demands for exact and precise programming have forced management to fully define its objectives and accurately identify the input and output requirements of logistic systems to be processed on Automatic Data Processing Equipment (ADPE).

e. The advent of the new computers with large memory capacity, high-speed throughput, acceptance of multiprogramming, off-line capabilities, real-time storage and retrieval, remote access, and video display adaptation presents new opportunities and challenges to the logistics managers. Furthermore, the development, standardization, and control of data elements and codes, together with the design of software and systems that fully exploit the state of the art to meet the changing operational materiel support needs, place a dual coequal obligation for discipline and control on the materiel and ADP management.

3. STUDY OBJECTIVES. The purpose of this monograph is to examine and evaluate selected automated logistic programs of the Services and DSA during the Vietnam era and to determine strengths, weaknesses, and lessons learned. The programs chosen for examination were the major wholesale systems of the Services and DSA. An examination was made of the methods used by each of the Services and DSA in resolving similar problems. They were examined as they existed at the beginning of the Vietnam era and as they developed in order to assess areas of importance and problems relating to the ADP support of logistic systems and operations.

4. SCOPE

a. In addition to assisting functional managers, automatic data processing served the needs of many commanders and their staffs. Frequently, logistic and operational programs, or combinations of both, were served by the same equipment. Some systems were for local use only; some had interfaces with other programs; some were a part of Service-wide systems. As an example of scope and variety, the programs of a single operational logistic command in 1968 encompassed the following logistic areas: material and supply readiness; equipment failure; parts usage; maintenance management; excessive maintenance requirements; scheduling and control of repairs; facilities management; logistical personnel management; disbursing; budget forecasting, monitoring and control; cost and performance analyses; monitoring operational unit levels of supply and their usage; port capability projections and performance; cargo shipment requirement projections; war reserve stocks; control of critical materials; construction projects; mobile logistic support operations; mail routing to fixed and mobile units; evaluation of support effectiveness; ordnance stock distribution, issue and expenditure controls; freight distribution. These are samples of major programs tailored to support missions and assigned logistic responsibilities. Important as they were to logistic support in the Vietnam era, the JLRB team had neither the time nor the staff to perform a comprehensive review of the full scope of ADP use by commanders and logistic managers.

b. Systems chosen for examination were primaily in the wholesale logistic area with attention to the relationship between retail requirements in Vietnam and their accommodation by and impact on continental United States (CONUS) wholesale systems in existence and under development. These were considered representative of the prevailing use, problems encountered, and lessons learned across functional areas and at different levels of operation for complex ADP systems in logistic support. However, the conclusions and recommendations stem basically from the areas explored.

c. Other monographs of the JLRB report discuss information systems and mention the use of ADP in support of the functional area involved (see monographs on Ammunition, Maintenance, Supply Management, Transportation, and Construction).

5. ORGANIZATION OF MONOGRAPH

a. Chapter II gives a general description of the situation related to ADP support, focusing on supply management during the Vietnam era. It explains the degree of automation existing at the start, problems encountered and reasons therefore, and major system changes during the era. It identifies areas in which Vietnam experience is reflected in Automatic Data Processing Systems (ADPS) for logistic support, the similarity between the Services in this respect, and

supporting rationale. The Service systems selected for review are named and reference is made to the appendix in which each is described. The general description and the appendixes reveal the basic areas in which further improvement is desirable; these are developed as major issues in Chapter III.

b. Chapter III states the problems addressed in this chapter and provides a system definition outlining the framework for the development of the major issues. This development builds on the foundation of Chapter II and the supporting appendixes and focuses attention on each major issue along with its related discussion, conclusion, and recommendation or observation. It is further supported by an appendix on ADP compatibility and standardization.

c. Chapter IV provides a summary consisting of an overview of the monograph, followed by conclusions and recommendations.

CHAPTER II

GENERAL DESCRIPTION

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GENERAL DESCRIPTION

1. IMPACT. Automatic Data Processing Systems (ADPS) had an important impact on logistic support in the Vietnam era both in-country and in the continental United States (CONUS). For this reason a group was established within the Joint Logistics Review Board (JLRB) to review ADPS in support of logistic management systems of the Services and the Defense Supply Agency (DSA) during the Vietnam era to determine strengths, weaknesses, and lessons learned.

2. EARLY AUTOMATIC DATA PROCESSING (ADP) SITUATION. At the beginning of the Vietnam era, 1 January 1965, each of the Services and DSA had computerized their basic logistic operations. However, automated logistic systems as we know them today were not generally in effect. The increasing workloads associated with Vietnam placed added stress on existing logistic support systems. Overall requisitioning volumes increased, but of more significance was the dramatic increase in Priority I and II requisitions, which reached 500 percent of previous levels in some instances, and which entailed more stringent processing response. This delayed the processing of lower priority requisitions to obtain computer configurations in varying degrees, either through higher capacity central processing units or increases in peripheral equipments.

3. LACK OF STANDARD SYSTEMS. The lack of uniformly established standard systems in Vietnam during early stages of deployment contributed to the problem. The conduct of an effective inventory and stock control operation is strengthened if an overall standard system exists to process information from the retail level through the wholesale support system. Even when authorized portions of the system are not available for immediate deployment, the value of an overall standard application is significant. As an example, the Air Force CONUS logistic support system was able to provide adequate support to Vietnam operations from the start, even though supply computers were not installed at base level. In-country computers would have provided the best service; however, acceptable support was still possible at the start by virtue of the overall standardized supply system, which also eased the subsequent phase-in of base level computers in-country. The most effective system, however, requires that adequate resources, in terms of ADP personnel, programs, equipment, and facilities, be available from the inception of the deployment to promptly achieve a maximum degree of ADP support.

4. CHANGES IN AUTOMATIC DATA PROCESSING SYSTEMS. Since the start of the Vietnam conflict, major changes have occurred in the overall logistic support and ADPS of the Services. Some of these were occasioned by the implementation of the Military Standard Systems directed by the Secretary of Defense. Military Standard Systems (MILS) are essentially communication programs designed to facilitate the Services interface with each other and their customers. A major improvement was the establishment of the Defense Automatic Addressing System (DAAS) which began in 1965. Under this concept the requisition originator does not have to research the address of the materiel manager but forwards the requisition to DAAS which automatically routes it to the supplier through appropriate communication channels. Another important advance which matured during this period is the Air Force Stock Number User Directory (SNUD) system which automated the complex process by which base level supply computers worldwide are updated with current stock number information and routed appropriate changes only to those bases for which the individual changes are pertinent. Other improvements, such as enlarged computer configurations and implementation of standard systems which were in the planning stage, were accelerated to accommodate the increased workloads experienced because of Vietnam operations. The appendixes to this monograph contain examples of the changes and other improvement effected during the Vietnam era.

5. SYSTEMS IN DEVELOPMENT. Logistic ADPS in development by the Services and DSA reflect the lessons learned during the Vietnam era. Thus, new systems tie together a wider spectrum of related processes through integrated data bases operating under standardized procedures. Automatic system features permit the computer to make routine recurring decisions involving high volume, repetitive functions based on rules described by logistic personnel, thus freeing managers to concentrate on more significant problems. Rapid information retrieval on call reduces the necessity for voluminuous periodic paper reports. Accuracy of basic, recurring information is enhanced by more checks and balances and by less human intervention in transfer of information. On the other hand, information for management purposes requires programmed consolidation of data at appropriate levels to avoid inconsistencies in timeliness and other factors.

6. SIMILARITY OF LESSONS LEARNED. The Service logistic systems support by ADP have basic requirements and differences stemming from the nature of the forces involved, their environment, and their modes of operation. However, many of the lessons learned by the Services and DSA and related system improvements are similar whether they apply to the Army National ADP Program for AMC Logistics Management (NAPALM), the Navy Uniform Automated Data Processing System at Inventory Control Points (UADPS-ICP), the Marine Corps Unified Materiel Management System (MUMMS), the Air Force Advanced Logistics Systems (ALS), or the DSA Standard Automated Materiel Management System (SAMMS). Variations are primarily a matter of scope and are based on the size of the system, and on the stage of actual development toward a mature system; however, experience alone does not account for current development progress. Two other key elements contributed significantly to these improved systems: the advance in computer technology occurring during this period and the further centralization of design agencies organized to cope with broad logistic areas and containing personnel trained to exploit the potential of these new technologies.

7. DESIGN CONSIDERATIONS. The similar experience pattern clearly shows the inadequacy of attempting a major system design by multiple activities within a Service. This is borne out by Air Force experience in first decentralizing design to Air Materiel Areas and then recentralizing design to achieve a successful system. Navy experience was similar in first attempting decentralized design or UADPS-ICP and then centralizing design to achieve a successful system. The Army trend is toward fewer centralized design activities for development of NAPALM, CS_3, COCOAS, and other major systems. A further step in this direction was the establishment of the Computer Systems Command at Fort Belvoir, Virginia, in March 1969 as the central systems design agency for the retail and Army-in-the-Field segments of the Army automated logistic system.[1] The Marine Corps MUMMS development was centrally conducted from the beginning, as was the DSA SAMMS. The effective use of centralized design activities is as important a step in a new system development as is the system concept itself, for experience shows that major systems developments on the scope required today have more chance for success if dedicated central design activities are involved. While it is recognized that many commands and activities require some organic programming capabilities for prompt and flexible response to unique applications, the large-scale standardized use of uniform rules and procedures dictate a central activity through which control can be exercised, and to provide a focal point for functional manager participation in system development and subsequent changes. This critical link between the functional user of the system and design personnel is strengthened through assignment of personnel of both types to integrated design centers.

8. IMPORTANCE OF REQUIREMENTS DEFINITION. The design center personnel combination has reflected a growing awareness of the necessity for the functional manager to define the information requirements of the function being managed and to accurately communicate these requirements to systems development personnel who can design them into supporting ADPS. No amount of ADP sophistication or cost can compensate for inadequate definition by the functional manager just as a highly complex and efficient ADPS is inadequate if it does not truly reflect these functional manager requirements. The marriage of functional definition and ADPS design is essential to effective logistic ADPS.

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[1] Article, Armed Forces Management, Army Centralizes Computer Controls, May 1969.

9. INCREASED INTERFACES. There has been a trend toward more interfaces between logistic ADPS and an increasing exchange of information among the Services. This is enhanced by the growing concentration of design personnel in central agencies which facilitates coordination and provides for the interchange of technical information between personnel with common interests and background. The ever-increasing complexity of computer technology and the continually expanding size of logistics management information requirements, in many cases, force the use of large scale integrated and standardized ADPS, such as the Air Force Recoverable Assembly Management System (AFRAMS) which provides increased visibility and control of selected equipment items, and the Management of Items Subject to Repair (MISTR) system which ties back orders for items in the distribution system to the priority for maintenance of those items. This evolution forces a discipline of design, programming, system maintenance, and related procedures and techniques which can most effectively occur in central design activities.

10. SYSTEMS SELECTED FOR EXAMINATION. The ADP team selected several major Services/DSA wholesale logistic systems making extensive use of ADP support as representative of the problems involved and solutions effected. These are referred to below and are examined in detail in the appendix noted.

a. Army. The Army Materiel Command (AMC) was established in late 1962 and inherited from the other Army commands a variety of supply systems with differing policies, procedures, and equipments. The AMC implemented its first standard system, the System-wide Project for Electronic Equipment at Depots (SPEED) in September 1963. This has been followed by other improvements already implemented and more in development (see Appendix A)

b. Navy. The Navy began development of a Uniform Automated Data Processing System at Inventory Control Points (UADPS-ICP) in 1962. The first operational program was implemented in October 1965 and improvements are continuing (see Appendix B).

c. Marine Corps. The development of the Marine Corps Uniform Materiel Management System (MUMMS) was started in 1964 and implemented in 1967. This will interface with other Marine Corps systems (see Appendix C).

d. Air Force. The Air Force had achieved a high degree of standard systems development at the start of Vietnam. The Item Management Stock Control and Distribution (IMSC&D) system had been implemented in all supply depots in 1961. This provided the springboard for further development (see Appendix D).

e. Defense Supply Agency. The DSA, like the AMC, was established in 1962 and inherited from the Services various systems which were in the process of standardization at the beginning of 1965. These have been coordinated and improved and development is continuing (see Appendix E).

11. SUPPORT CONSIDERATIONS. Generally speaking, the systems in effect today in these functional areas are providing adequate support to customers, and those systems implemented or improved during the Vietnam era, as well as those now in development, reflect the lessons learned. However, even more effective support is achievable through increased response and overall economy by the further application of the following approaches:

a. Provision for ADP Capability Upon Initial Deployment. Logistic contingency plans must assure adequate ADPS support to accomplish in-country processing demands. This may be achieved through various combinations of deployable equipment, from computer systems in-country to remote terminals connecting through appropriate (deployable) communications to out-of-country computers. The requirement must be stated in contingency plans.

b. Improved Data Transmission Capability. It should be recognized that adequate quality communication links will be required to enable the installation of equipment at all points capable of supporting ADP operations. (While this monograph treats communication only in its supportive relationship to ADPS, a more comprehensive overall treatment of communications is contained in the Communications Monograph of the Joint Logistics Review Board report).

c. Greater Centralization of System Design and Development. The trend indicates that the Services are, by evolution, carrying out design and development of complex ADPS of wide applicability through centralized organizations.

d. Functional Manager Involvement. Increased functional manager involvement in systems development by those being served by ADPS is essential to ensure that new systems are designed to be responsive to their needs as well as performing the increasing number of functions of which they are capable. This increased capability also makes available a broader range of data to the logistics management and command. To preclude becoming inundated with such data the functional manager must participate more actively in the development of ADPS to ensure that the system is designed to provide him with only that data needed for his function, and in an appropriate form.

e. Improved Responsiveness of ADPS to the Logistics Manager. Examples of techniques to improve responsiveness are management decision tables, data element and code standardization programs, multiprogramming and multiprocessing.

f. Reduction in ADPS Design Time. The need for a reduction in ADPS design time is recognized to ensure economical ADP applications. Existing procedures entail a lengthy process of system specification through equipment selection, which sometimes obsolete the design before it is implemented. Streamlining of these procedures would contribute to increased effectiveness and economy.

g. Establishment of Libraries of Programs of Wide Applicability Within Each Service and DSA. The centralization of system design and control and establishment of program libraries will contribute to greater integration of systems and programs both within and among the military services and DSA.

CHAPTER III

MAJOR ISSUES, CONCLUSIONS, AND RECOMMENDATIONS

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MAJOR ISSUES, CONCLUSIONS, AND RECOMMENDATIONS

1. STATEMENT OF THE PROBLEM. Chapter II and Appendixes A through E highlight the strengths, weaknesses, and lessons learned during the Vietnam era. It is recognized that the Services and Defense Supply Agency (DSA) have or are taking action concerning them. Further significant improvements are desirable and can be achieved in the following areas, each of which constitutes a major issue of this monograph.

a. In-theater ADP capability.

b. Organization for systems design and programming control.

c. Responsibilities for ADPS design and development.

d. Intraservice and interservice coordination.

2. DEFINITION OF SYSTEMS. Analysis of Automatic Data Processing Systems (ADPS) and Management Information System (MIS) is dependent upon the meaning of each term. The Bureau of the Budget defines "systems" as "an assembly of procedures, processes, methods, routines or techniques united by some form of regulated interaction to form an organized whole."[1] Management Information Systems can best be defined as "the results of the implementation of related policies and procedures, which utilizing electronic processing devices, produce data necessary to coordinate, control, and/or to make decisions applicable to the functions processed ...." (See Appendix F.)

a. Functional ADP operating systems (application programs) are those computer or punch card processes or procedures which execute the handling of paperwork to accomplish the logistic function. It is from these operating systems that management information and the management information handling systems are derived.

b. Management Information Systems can be categorized into four types:

(1) Reports emanating entirely from either the functional ADP operation or the data base used. Generally, these are controlled by Reports Control Symbols (RCS) issued at the level of management requiring the information.

(2) Operating statistics generated automatically on a planned basis from the functional ADP operating system transactions or data base. These provide various levels of management with the statistics necessary to control the operation or evaluate the effectiveness of the function.

(3) Listings, reports, and answers to inquiries generated from the data base or the transactions processed. Normally this type of information is the result of one-time requests initiated by management to facilitate specific decisions or evaluations.

[1] Executive Office of the President, Bureau of the Budget, Automatic Data Processing Glossary, December 1962.

(4) Summaries, evaluations, simulations, and analyses. Based upon greater recognition and definition of functional systems requirements by management, this area can be enlarged to reduce more costly forms of management information and thereby achieve a higher degree of cost effectiveness.

3. DISCUSSION AND ANALYSIS OF THE PROBLEM

a. In-Theater ADP Capability

(1) Difficulties Encountered During Early Operations. The Supply Management monograph develops that during the early Vietnam era it was not possible to rely on manual systems to handle the ever-increasing processing workloads, or to communicate with the automated wholesale systems in the continental United States (CONUS). Upon receipt of Automatic Data Processing Equipment (ADPE) in-country, the achievement of expected benefits were considerably delayed in some instances due to the fact that equipment was not operational; programs had not been developed in advance, including interface with manual systems in the field; and trained personnel were not available. These conditions deferred the mechanical processing of requisitions and automation of other inventory control functions, thereby hampering effective accomplishment of stock control functions. Only the Marines deployed ADP capability to Vietnam in early 1965, and this proved not too effective because of a lack of environmental control, spare parts, and technical assistance. Even after overcoming these problems they found the equipment inadequate, changing to an IBM S/360-30 in February 1967 and to an S/360-50 in April 1969. The other Services implemented in-country ADPS beginning in early 1966.

(2) Contingency Planning Considerations. The lack of adequate ADPS and technical personnel during the early Vietnam era strengthened the need for a more realistic and effective ADP contingency plan. The amount and type of ADP support must be based on a realistic assessment of support requirements for the contingency. If this exceeds the Service resources necessary to accomplish the contingency and also effectively continue essential existing support operations, steps should be taken to provide for the total requirement.

(3) Mobility Aspects. Construction of facilities for ADPE and operation is considered in the context of fixed installations versus mobile or transportable facilities. Each of the Services have deployed and used mobile units of various types essentially suited to the environment of the operation and the support required.[2] Since the trend to mobile operations is continuing, advantage must be taken of microminiaturization of equipment to reduce its weight and size.

(4) The Importance of Communications. The ability of the Services and DSA to communicate logistic data is limited essentially to the commonality and uniformity provided by the standard punch card. The punch card has many limitations. The most notable is the limitation to a certain number of columns of data and the relatively slow speed in processing and transmission. The actual subject of communication is treated here only in its supportive relationship and value to ADP.

(a) Experience has shown that, in-country, punch cards are manually carried from point to point in many instances because of the lack of quality or adequate transmission facilities. Improved communication is necessary to eliminate the current problems associated with the transmission of the basic punch cards.[3]

(b) An intermediate improvement can be achieved by more widespread use of magnetic tape transmission using a device referred to as a stand alone tape unit.

[2] Article, AIRMAN Magazine, The New Flying Machine, May 1969.

[3] Communications Monograph, Chapter II, Historical Review, Appendix E, Buildup of Message Switching Networks in RVN.

This mode of transmission is now generally limited to facilities located in CONUS were high quality communications facilities are readily available.

(c) Deployable remote devices tied to CONUS or other processors could perform essentially the same mission as the deployment of a full computer system. While smaller in size and weight and requiring almost no special operating, systems, or maintenance personnel, effective use of such devices depends on adequate (though not necessarily dedicated) communication links. A notable example is the Royal Air Force development which will use up to 600 remotes at 100 different locations.[4]

(d) Adequate, quality communication links, when and if they provide a speed of transmission compatible to the requirements established for input to computers, will enable the installation of equipment at all points which will be capable of operating in an overall real time mode.

(e) Computer to computer (memory to memory) communications require direct communication lines. The cost of dedicated networks is several times larger than common-user systems and networks. The maximum economy in telecommunications systems is achieved through sharing common-user systems and networks. Traffic transmitted over allocated or dedicated circuits cost more per unit of traffic, proportional to the extent that these circuits are utilized less than a compatible circuit in a common-user system. Common-user systems provide advantages in flexibility and reliability through their switching and alternate routing capabilities. A remaining justification for dedicated circuits, when not continuously loaded, is the requirement for immediate availability. Advancing technology in electronic switching techniques is diminishing this factor. If logistic systems ADP support is to advance to the stage of direct memory-to-memory transmission, a careful analysis of all factors involved must be made to determine the cost effectiveness of such operation.

(5) Conclusions and Recommendations

(a) Conclusion. One of the major lessons learned during the Vietnam era was the importance of in-theater ADPS during initial deployment to the realization of maximum logistic support (paragraphs 3a (1)-(5)).

(b) Recommendation. The Board recommends that:

1. For contingency operations, each Service have available ADPS packages compatible with the CONUS system with which they must interface. These ADPS packages should include mobile ADPE, proven programs, data transmission equipment, and trained personnel, and must be so designed that they can be readily expanded to meet unforeseen requirements without major problems in translation to greater capacity. Contingency plans should provide for early deployment of an ADPS package adequate to meet forecasted in-country logistics management requirements, with a reasonable safety factor to meet unforeseen demands (DP-1).

b. Organization for Design and Programming Control

(1) Events Contributing to Organizational Pattern. As hardware and software systems have improved and as their use has expanded, the costs and skills required to develop and maintain computer systems for logistics management have continued to rise. To make full and economic use of computers, it has become necessary and desirable to standardize and centralize system design, programming, and control at higher organization Service/DSA levels for systems having wide applicability.

[4] Staff paper prepared by Royal Air Force Wing Commander A. J. MacKay for the U.S. Air Force Assistant for Logistics Planning, Proposed Royal Air Force Supply Computer Replacement, 9 January 1970.

(a) At each higher level more variables have been introduced, resulting in more complex systems. In addition, since computer technology has required almost total interdependence of data systems and hardware, each system requires a standard computer configuration. This requirement has applied greater pressure on the selection process to ensure minimum life cycle costs.

(b) The overall effect of standardization and centralization at higher levels has been that of consistent improvement. It has provided higher level activities with greater flexibility and control through more compatible data bases for decision processes and uniform system changes.

(2) Advantages of Standardization. Some of the advantages which stem from equipment standardization are listed below. (Details are given in Appendix F.)

Standard Routines

Programming Languages

Tapes, Immediate Access Storage (IAS), and Formats

Training

Staffing

Standard Operational Procedures

Utilization Reporting

Standard Costing

Contractual Relationship

Planning and Expansion

Mission Transfer

Equipment Costs

(3) Increased Communication in Automated Logistic Systems. Actions taken to standardize ADPS within DOD components (e.g., standard requisition forms) and to produce the Federal Stock Numbering System have greatly facilitated the development of the Military Standard Systems (MILS) family, while still making allowance for the specialized needs of each Service. This family of systems provides standard procedures and formats for communicating between and within automated logistic systems of the military services and DSA. They also assist in the development of new automated systems by prescribing in advance specific formats and procedures. The MILS family consists of:

(a) MILSCAP—Military Standard Contract Administration Procedure, DOD Instruction 4105.63, 10 May 67.

(b) MILSTAMP—Military Standard Transportation and Movement Procedure, DOD Instruction 4410.6, 24 August 1966.

(c) MILSTEP—Military Supply and Transportation Evaluation Procedure, DOD Instruction 4000.23, 12 January 1967.

(d) MILSTRAP—Military Standard Transaction Reporting and Accounting Procedure, DOD Instruction 4140.22, 3 August 1964.

(e) MILSTRIP—Military Standard Requisitioning and Issue Procedure, DOD Instruction 4140.17, 2 April 1968.

(4) ADP Relationship to Integrated Logistics Support. A vital link in the overall logistics support programs is the technical management capability and contribution to mission effectiveness of the weapons/project managers of the military services. A basic issue is the relationship between conventional support managers, e.g., the functional commodity/item manager and the weapon system/project officer assigned responsibility for developing and employing a specific weapon.

(a) DOD Directive 4100.35, Integrated Logistics Support (ILS), outlines the broad objectives and concepts for hardware systems support; however, there are still differences in interpretation, implementation, and management systems compatibility. There is an awareness of the need for a more systematic approach to ILS for weapons and equipment through increased emphasis on item management, particularly as computer and communications systems become more standardized. To attain a greater degree of response in all system elements, it is essential that the ADP interfaces be carefully engineered and that techniques, methods, formats, and those data base interfaces which are now generally incompatible, be engineered to provide a consistent information flow to both the functional/item manager and the weapons/project manager to provide an automatic, integrated interface of consistent data.

(b) The following illustration is representative of an approach to ILS through the increased application of ADP techniques.[5]

1. The standard file organization and structure, e.g., the Federal Stock Number Master Data Record (FSNMDR), provides the basic structure for the incorporation of data consistent with the requirements of both managers. All data related to a Federal Stock Number (FSN) are located in one file structure. The structure can be sectorized to include not only all item data but also end item application and end item parts relationship. This direct interface between items and end items can be dissected or explored in either direction.

2. Establishment of a similar file for new data during the provisioning process will enable cross interface with item data already in existence. The point at which transfer of data between files occurs may possibly come with the establishment of FSN identification.

3. The close relationship between files and between sectors in the FSNMDR enables the functional manager to control assets for all purposes and to compute requirements on a more realistic basis.

4. Item data in the FSNMDR (which includes on-hand assets, due-ins, procurement data and unit price) enable computation of cost factors for the weapons/project manager on any basis desired.

5. Using the same file structure, the weapon/project manager can establish a Program Data File which will contain program data by type (e.g., flying hours, rounds fired, miles driven) for specific areas by end article application to use in computing studies and program change factors.

(5) Development Cycle Improvement. The development cycle for ADPS can become more responsive to the environment within which ADP attempts to support logistics requirements. The existing requirement for comprehensive systems design as a basis for equipment specifications result in deferring the advantages of new programs for extended

[5] U.S. Army Materiel Command, FY 1971 - 1975 U.S. Army Materiel Command Five-Year ADP Program, 30 September 1969.

periods of time. This situation can be improved through expanded use of the following techniques which can be more easily applied in a centralized development activity.

(a) Benchmark programs to solicit manufacturers proposals rather than detailed specifications.

(b) Simulation techniques within fabricated models to speed development of both design and equipment characteristics.

(c) Specification of modularity to provide added capacity through changes or additions to peripheral equipment rather than mainframe changes.

(d) Incorporation of an adequate processing time allowance for mobilization reserve, disaster, internal expansion capability, and backup to other installations.

(e) The exemption of electronic calculators (with internal memory) and Electronic Accounting Machine (EAM) equipment or other labor saving devices, from "computer" procedures, when they can be justified through normal channels.

(6) Advanced Techniques. Advanced computer technology permits greater use of techniques such as the following, which are discussed more fully in Appendix F.

(a) Modular programming permits change of modules within large programs to accommodate changing functional requirements.

(b) Multiprogramming, time-sharing, multiprocessing, and multitasking provide more efficient use of ADPE.

(c) Standard language, file structures, and other techniques can achieve greater compatibility between dissimilar computer equipment. Based upon the rationale developed in Appendix F, it is estimated that significant savings in time and money can accrue from use of these tools.

(7) Contribution of Centralized Design. Techniques such as those illustrated above are highly desirable and are most feasible when conducted through a centralized design and development organization staffed and equipped to cope with the complex and integrated aspects of the overall system, which can produce and control a standard system for Service-wide and DSA application.

(8) Conclusion and Observation

(a) Conclusion. A positive trend is evident of greater centralization of logistic ADPS design to conserve the funds, skills, and manpower available. The degree of centralization varies between the Services and DSA because of size, scope, and complexities of standard systems under development. Essentially, centralized agencies have been established within the Services for wholesale and retail level design. The Service/DSA should intensify its control to ensure compatibility of systems between all levels and their use on a worldwide basis (paragraph 3b(1)-(7)).

(b) Observation. The Board notes with approval steps taken by the Services/DSA and encourages maximum standardization, integration, and interface through the establishment or further centralization of systems design and programming which will ensure compatibility between wholesale and retail systems; enhance intraservice communications; extend the use of standard equipment; increase compatibility and machine independence of computer programs and operating systems; improve the utilization of necessary skills and manpower; and increase the effectiveness, economy, and responsiveness of ADPS in support of logistics.

c. Responsibilities for Systems Design and Development

(1) System Cost and Complexity Forces Greater Coordination. The increasing scope and complexity of ADPS force all major groups involved in development to become more effective in the process. A single worldwide functional system within a Service can require more than 1,000 man-years of skilled effort to achieve the initial implementation system. (Estimates from the Services and DSA for the following systems: Army NAPALM Program, 2,000 man-years; Navy UADPS-ICP System, 1,169 man-years; Marine Corps MUMMS, 1,011 man-years; Air Force Standard Worldwide Supply System, 1,100 man-years; DSA SAMMS, 650 man-years.) The need for increased effectiveness applies equally to functional managers who originate the system requirements, systems analysts who translate these requirements into documents suitable for programming, and the programmers who perform detailed documentation. It applies individually and collectively, as the functional manager must participate in varying degrees through the entire process from proposal through system implementation, while analysts and programmers must also overlap the other areas.

(2) Changing Management Requirements. The trend toward more complex systems and centralization of systems design, programming, and control has generated a requirement for managers with broader experience. The new positions require managers with greater knowledge of ADP and its potentials. Such personnel must be capable of developing and translating broad system concepts into efficient and practical automated systems which provide the proper man-machine mix and responsiveness to logistics management requirements. While there has been progress, the increasing number, scope, and complexity of logistic systems combined with the rapidly accelerating trend to central design and programming offices are placing greater pressure on logistic manpower programs to produce an adequate flow of qualified personnel.

(3) Responsibilities of Functional Managers. The functional manager needs to carefully assess decisions for which he is responsible, and the type, quantity and format of information he must have to make such decisions. He should learn to rely on having access to information rather than accumulating volumes of printed information against a possible need. The functional manager's participation may be through one or more of his representatives working closely with systems design and programming groups or through assignment of staff responsibility for coordination, but he should retain the ultimate responsibility for coordination and approval of the system with all levels of higher echelons. The NAPALM Pilot Plan[6] contains an appropriate assignment of responsibilities. It indicates that the functional manger should:

(a) Represent the functional aspects of systems development, including dissemination of appropriate guidelines and standard functional procedures.

(b) Develop overall system requirements and functional system specifications.

(c) Provide appropriate interpretive or policy decisions.

(d) Coordinate and resolve conflicts between elements regarding functional requirements.

(e) Review documentation and recommend approval or disapproval prior to submission for publication.

(f) Furnish or make provision for required personnel resources.

(g) Review data for testing and debugging operations to ensure proper consideration of the unique requirements of this function.

[6] U.S. Army Materiel Command, Regulation 18-12, NAPALM Pilot Plan, August 1967.

(h) Participate in development and approve the plan and requirements to be demonstrated at system test evaluation.

(i) Approve the training package for functional personnel.

(j) Participate in the conversion and implementation of the system.

(k) Prepare reports as required.

(4) Responsibilities of ADP Personnel. ADP computer systems programmers and analysts have the following responsibilities.[7] They should:

(a) Assist in developing the systems logic by preparing functional flow charts, systems charts, application charts, and run charts.

(b) Assist the functional representative in defining data elements.

(c) Assist in developing the necessary input formats.

(d) Assist in designing output formats.

(e) Complete the structure of the master file organization for areas assigned.

(f) Develop any intermediate or transaction file formats as may be necessary.

(g) Prepare general and detailed ADP block diagrams.

(h) Code application computer programs in accordance with prescribed standards.

(i) Participate in the development of test data for testing and debugging operations and test and debug application computer programs.

(j) Develop production and scheduling package to include determination of run frequencies, cutoff periods, product due dates, number of copies, copy distribution, etc.

(k) Comply with prescribed documentation requirements.

(l) Assist the functional representative in the preparation of the functional regulations and local procedures, and associated training packages.

(m) Prepare and implement training packages for ADP operations.

(n) Participate in the conversion and implementation of the system.

(o) Report problems through the established channels.

(p) Participate in preparation of required reports.

(5) Shared Responsibility. Regardless of the specific assignment of responsibilities, team effort and the closest possible exchange of information is required between the functional manager and the ADP programmers and analysts in systems development.

[7] Ibid.

(6) Techniques Available to Managers. Significant dividends to management can accrue from a broader knowledge by managers of techniques available to them through ADP which can make their work easier and more effective. These include greater use of summarized and evaluated information, simulations, analyses, and reliance upon data available on call, rather than recurring reports. Establishment of computerized management decision tables or parameter tables to provide criteria and guidelines will enable managers to integrate the computer into their decisionmaking process.

(7) Personnel Availability. The balance of available personnel has been affected by the austere personnel funding program over the past several years which has forced managers to utilize ADP in the performance of routine tasks so that the reduced workforce may perform other higher priority mission tasks. Also, because of the rapid expansion of the ADP field there continues to be a high personnel turnover rate. Expanded training and the establishment of standards for workload forecasting would provide a more realistic assessment and accomplishment of logistic ADP resource requirements. Consideration should be given to further in-house ADP training to complement contractor training and alleviate the shortage of necessary skills.

(8) System Relationship. Management Information Systems (MIS) are being increasingly incorporated into automated functional operating systems. This trend should reduce design cost by eliminating multiple systems.[8]

(9) Environment. Both functional and ADP managers should be aware of the future environment within which systems will be developed and operated. According to the Stanford Research Institute study, this environment will be characterized by:

(a) High turnover of personnel engaged in logistic functions.

(b) Increased centralization of control at all echelons.

(c) Greater reliance on ADP support.

(d) Continued rapid advances in the capabilities of data processing and communications systems.

(10) Principles. Managers should also understand that the MIS design for the future should be based on the following principles. The system should:

(a) Measure and evaluate logistics performance.

(b) Make maximum use of common data.

(c) Provide timely information and data.

(d) Respond to the needs of the user.

(e) Have an acceptable cost-benefit relationship.

(f) Develop reliable information and data.

(g) Provide for the application of procedures on a worldwide basis.

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[8]Stanford Research Institute, Menlo Park, California, Part II, System Design, Volume I, Executive Summary, prepared for U.S. Army Research Office, Arlington, Virginia, Contract DA-HC19-67-C-0023, An Integrated Materiel Readiness, Supply, and Maintenance Management Information System, September 1968.

(11) Concepts. Design of the MIS for the future should be based on the following concepts to form a single integrated system:[9]

(a) Centralized control over functional areas at selected levels, coupled with procedures that employ ADPE.

(b) Maximum use of common data generated at any level through mechanization of routine operations which provide reporting and controlling information at appropriate echelons.

(c) A uniform basis for measuring and evaluating performance at various echelons.

(d) Use of the management by exception technique in developing management information.

(12) Premises. Premises on which the future MIS design should be based are:

(a) Management information requirements to evaluate the logistics functions at each level are directly related to the degree and extent of the control exercised at each level.

(b) ADP machine time for development of logistics control and management information at each level can be made available through advance planning.

(13) Representative Nature of Illustrations. The above comments concerning future ADP environment, principles, concepts, and premises are taken from the Stanford Research Institute study. They are presented as representative illustrations of the climate in which ADP systems will most likely operate in the future.

(14) Continuing Responsibility of All Managers. All managers and key personnel in the design and development process have a continuing responsibility to upgrade their knowledge of ADP techniques and devices and relate this knowledge to more effective, efficient, economical, and responsive logistics ADP systems within the framework of the future environment, principles, concepts, and premises enumerated above.

(15) Conclusion and Recommendation

(a) Conclusion. The formulation, design, and development of a major system is a large and significant undertaking. It is not uncommon for 1,000 man-years of skilled effort to be required for achievement of an initial prototype for a standard Service system. Commitment of resources to this extent dictates that managers at all levels must be knowledgeable of the capabilities and the limitations of computer systems. Functional managers must make their requirements understandable to systems design personnel for effective translation into ADPS. Maximum participation and mutual understanding among functional managers and ADP development personnel is essential to ensure accurate system definition and development of systems which exploit the potential of advancing computer technology (paragraphs 3c(1)-(14)).

(b) Recommendation. The Board recommends that:

1. Each Service and DSA provide definitive Service-wide guidelines such as those illustrated in USAMC Regulation 18-12, August 1967, setting forth the responsibilities of functional managers, systems analysts, and programmers in the translation of logistic policies, objectives, and concepts into the detailed design and development of automated logistic operational and management systems to increase their responsiveness to functional management requirements and permit the development of logistic concepts in consonance with ADP technology (DP-2).

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[9] Ibid.

d. The Need for Intraservice and Interservice Coordination

(1) Increased Responsiveness Through ADP. Effective and flexible management techniques are necessary to process the paperwork inherent within systems operation, maintain a highly accurate data base, and respond to management requirements within acceptable time frames. Greater use of the ADP management techniques listed below will increase ADP responsiveness to requirements of both management and its customers (see Appendix F for detailed discussion):

(a) Extension and acceleration of DOD and Service/DSA data element and code standardization programs, which are designed to:

1. Facilitate interchange and compatibility of data elements.

2. Avoid costly and time-consuming redevelopment of available data elements.

3. Eliminate duplicate data elements to reduce the total controlled and used.

4. Reduce data processing costs by using standard codes in lieu of full descriptions.

5. Facilitate development of standard systems.

(b) Design and use of standard computer processing codes with cross reference tables to external code usage to limit the impact of code changes on standard computer programs.

(c) Establishment of a classification technique to avoid proliferation and duplication of effort in the design and development of systems. Systems which are not classified cannot be identified and their content cannot be measured or cataloged for effective management control or use. An example of a classification technique is contained in the AMC Five-Year ADP Program.[10]

(2) Techniques for Increasing Coordination. The following standard documentation techniques can reduce time and effort for both production and use of ADP documentation while also facilitating coordination (see Appendix F):

(a) Publication of standard ADP logistic terminology, other than standard data elements and codes, in a DOD-wide logistic ADP glossary to eliminate variations in descriptions of systems and processes between levels and programs and to enhance oral and written communication between elements.

(b) Automatic flow charting techniques:

1. ADP block diagrams to reduce programmers time in creating source programs and to assist in preparing preliminary outlines and layouts for detailed programming and module definition.

2. Definition and charting of functional requirements to enable easy comprehension and approval by functional managers.

(c) Indexing all standard computer programs through Service/DSA regulations with dedicated number designations to indicate level, program function, language, and

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[10]U. S. Army Materiel Command, FY 1971-1975 U. S. Army Materiel Command Five-Year ADP Program, 30 September 1969.

equipment. Publication of computer programs within a standard format will ease the formation of a library of standard systems and programs for Service/DSA use. Standard systems include:

1. Standard programs implementing a system or application throughout a Service or DSA.

2. Standard programs implementing a system or application which is less than Service/DSA-wide but includes more than one level of the command or Service/DSA.

3. Programs that are necessarily classified as standard but are unique to one installation or level, and as such are available for use in other installations or organizational levels if required.

(3) Standard Systems Library. The library of Service/DSA documented and standard systems, in indexed and extracted formats of essential elements of data, should be computerized to permit easy and possibly remote access to the information. The Services/DSA would use the computerized data for:

(a) Control of new systems requirements.

(b) Control of duplicate development of like functions.

(c) Employment of models to enable:

1. Matching of existing systems.

2. Evaluation of new systems requirements and/or changes.

3. Parametric simulation of preliminary application systems design, including consideration of alternative and related costs.

4. Optimization of systems and/or programs.

5. The control of systems automation through simulation techniques in the areas of applications, ADP equipment, software, and management. Details are given in Appendix F.

(4) Coordination Through Groups or Committees. In addition to the advantages of an indexed, computerized library of computer programs of wide applicability, capable of cross-dissemination, there is a need for cross-fertilization of knowledge and ideas concerning ADP. The establishment of groups or committees representing organizations within and between the Services and DSA would facilitate the ability to:[11]

(a) Exchange ideas and information regarding ADP state of the art.

(b) Provide the means for identifying and exploring common problems.

(c) Provide a forum for the development of facts and resulting consensus on significant issues affecting the management and operation of ADP.

(d) Promote improvement in ADP management and operations.

(e) Provide advice and assistance to higher authority in the formulation, interpretation, and application of ADP policies, plans, and programs.

[11] Ibid.

(5) Conclusion and Recommendation

(a) Conclusion. Interservice coordination does exist to some degree, based on limited personal knowledge of what is available or what is being done in the Services. Greater interservice coordination on a more formal basis would result in a more effective and economical operation. The Office of the Secretary of Defense has established an ADP policy committee to advise the Assistant Secretary of Defense (Comptroller) on the ADP management program. Each Service will be represented by a senior official, and the committee is empowered to establish task groups as may be required to facilitate the resolution of matters before the committee. This policy committee appears to be an excellent mechanism to achieve the benefits available from cross-utilization of experience (Paragraphs 3d(1)-(4)).

(b) Recommendation. The Board recommends that:

1. A joint Service/DSA task group be established by the Assistant Secretary of Defense (Comptroller) Automatic Data Processing Policy Committee to develop policies and procedures for the establishment of a central library of logistically oriented ADP programs within each Service and DSA to facilitate exchange of programs within and among the Services and DSA (DP-3).

CHAPTER IV

SUMMARY

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SUMMARY

1. OVERVIEW. Automatic Data Processing Systems had an important impact upon logistic support in the Vietnam era both in-country and in the continental United States (CONUS). By 1 January 1965, each of the Services and the Defense Supply Agency (DSA) has computerized its basic logistic operations in CONUS.

a. Initial operations in Vietnam involved the use of manual systems for in-country support. The interface between these systems, which relied heavily upon punch card operations, and the more computerized wholesale systems, posed difficulties until further in-countr mechanization was introduced. The Services varied in time of introduction of in-country computers, with the Marine Corps providing the earliest computers in 1965.

b. The increasing workloads associated with Vietnam placed added stress on existing logistic support systems, and the Services frequently upgraded their computer configurations in varying degrees, through either higher capacity central processing units or increases in peripheral equipments.

c. Major changes in the overall logistic support and Automatic Data Processing Systems of the Services and the Defense Supply Agency have occurred since the start of Vietnam operations. Some of these were caused by the implementation of the Military Standard Systems directed by the Secretary of Defense. Others were improvements by one Service or the Defense Supply Agency which were also applicable to the others, such as the DSA Defense Automatic Addressing System. Some changes were internal to a Service and interactive with another, such as the Air Force Stock Number User Directory System that interacts with the Defense Automatic Addressing System.

d. Logistic Automatic Data Processing Systems in development by the Services and the Defense Supply Agency reflect the lessons learned during the Vietnam era. Thus, new systems will tie together a wider spectrum of related processes operating under standardized procedures. Automatic system features will permit the computer to make routine recurring decisions involving high volume, repetitive functions based on rules described by logistic personnel, thus freeing managers to concentrate on more significant problems. Rapid information retrieval will reduce the necessity for voluminous periodic paper reports. Accuracy of basic recurring information will be enhanced by more checks and balances and by less human intervention in the transfer of information. In using data for management purposes, however, there will be a need for its programmed consolidation to provide the summary data required on a uniform time basis and at the requested intervals.

e. A substantial expansion occurred during the Vietnam era in the use of Automatic Data Processing and in ADP-oriented information systems as an aid to logistics management. This occurred at many command levels and across many logistic functions.

f. In view of the limited time available, the Joint Logistics Review Board team selected for review major Services/Defense Supply Agency wholesale logistic systems making extensive use of Automatic Data Processing support as representative of the problems involved and solutions effected. These systems are amplified in appendixes to this monograph and significant factors are incorporated into the monograph chapters.

g. Even though Service logistic systems supported by ADP have basic requirements and differences stemming from different missions, environment, and their modes of operation,

many of the lessons learned and related system improvements are similar. Many variations are a matter of scope based on the size of the system and on the stage of actual development toward mature systems.

h. There has been a trend toward more interfaces among logistic Automatic Data Processing Systems to accommodate within a single overall design structure many important segments that were formerly handled individually. For example, the Marine Corps Unified Materiel Management System (MUMMS) incorporates information related to supply, financial, procurement, technical data, and maintenance areas.

i. The growth of large-scale integrated and standardized Automatic Data Processing Systems, with the use of advanced computer technology, has fostered a discipline of design, programming, system maintenance to accommodate changes, and related procedures and techniques which can most effectively occur in central design activities. These activites involve personnel who possess the proper skills to accomplish the diverse tasks associated with the creation and operation of Automatic Data Processing Systems, and who can facilitate participation by logistics management personnel.

j. During the Vietnam era, extensive efforts have been put forth and many improvements realized in ADP support of logistics, and this is reflected in the increased application of ADPS by the Services. Generally speaking, the systems in effect today in the areas examined are providing adequate support to customers, and those systems implemented or improved during the Vietnam era, as well as those now in development, reflect the lessons learned. However, even more effective support is achievable through increased response and overall economy by the futher application of the following approaches, which are addressed as major issues in the monograph.

(1) Introduction into the theater as soon as possible of ADPS capability with proven systems.

(2) Centralized design and development of systems having wide applicability.

(3) Increased functional manager and command involvement in systems development.

(4) Increased interservice coordination through the establishment of libraries of programs of wide applicability within each Service and the Defense Supply Agency.

k. The most important lessons learned identified in each issue area, together with the recommendations developed by the Board, are presented in the following paragraphs.

2. MAJOR ISSUES

a. Lessons Learned

(1) One of the major lessons learned during the Vietnam era was the need in-theater for adequate Automatic Data Processing Systems as soon as possible after the initial deployment to provide the means for maintaining asset records, to ease the problem of requisitioning on the wholesale system, to control stock levels, to furnish responsive issues to customers, and to manage maintenance operations. In order for these Automatic Data Processing Systems to be effective, they must include proven programs and trained personnel, as well as adequate ADP and data transmission equipment in transportable modules.

(2) There has been an increase in centralized design of logistic Automatic Data Processing Systems of wide applicability to conserve the funds, skills, and manpower available; to ensure desired uniformity among users; to provide for interface of programs; and to ensure that policies of management are provided for adequately. Centralized agencies have been established within the Services, for example, for wholesale and retail level design. These

design groups can ensure compatibility of systems between levels, and facilitate their use on a worldwide basis.

(3) Maximum participation and mutual understanding among functional managers and ADP development personnel are essential to ensure the proper application of computers to logistic systems and to exploit the potential of advancing computer technology. Functional managers and commanders must make their requirements understandable to ADP systems design personnel for effective translation into Automatic Data Processing Systems, and ADP personnel must ensure that these systems accurately reflect the requirements. Definitive guidelines such as those in Army Materiel Command Regulation 18-12 can assist in this process. For large systems, 1,000 man-years of skilled effort may be required to provide an initial prototype for a standard Service system. Commitment of resources to this extent dictates that managers and commanders at all levels must be knowledgeable of the capabilities and the limitations of computer applications, and must participate in the basic decisions for system design.

(4) A degree of interservice coordination exists by the informal exchange of information among personnel associated with Automatic Data Processing support of logistics. However, greater interservice coordination on a formal basis could be more effective. The establishment and operation of computer program libraries within the Services and the Defense Supply Agency would enhance such coordination. The Office of the Secretary of Defense has established an Automatic Data Processing Policy Committee to furnish advice to the Assistant Secretary of Defense (Comptroller) on the Automatic Data Processing management program. Each Service is represented by a senior official, and the committee can establish task groups as may be required to facilitate the resolution of matters before the committee. This policy committee appears to be an excellent mechanism to monitor the development of Services Defense Supply Agency computer program libraries.

b. Recommendations

(1) For contingency operations each Service have available Automatic Data Processing Systems packages compatible with the continental United States system with which they must interface. These Automatic Data Processing Systems packages should include mobile equipment, proven programs, data transmission equipment, and trained personnel, and must be so designed that they can be readily expanded to meet unforeseen requirements without major problems in translation to greater capacity. Contingency plans should provide for early deployment of an Automatic Data Processing Systems package adequate to meet forecasted in-country logistics management requirements, with a reasonable safety factor to meet unforeseen demands (DP-1).

(2) Each Service and the Defense Supply Agency provide definitive Service-wide guidelines such as those illustrated in Army Materiel Command Regulation 18-12, August 1967, setting forth the responsibilities of functional managers, systems analysts, and programmers in the translation of logistic policies, objectives, and concepts into the design and development of automated logistic operational and management systems to increase their responsiveness to functional management requirements and permit the development of logistic concepts in consonance with Automatic Data Processing technology (DP-2).

(3) A joint Service Defense Supply Agency task group be established by the Assistant Secretary of Defense (Comptroller) Automatic Data Processing Policy Committee to develop policies and procedures for the establishment of a central library of logistically oriented ADP programs within each Service and the Defense Supply Agency to facilitate exchange of programs within and among the Services and the Defense Supply Agency (DP-3).

APPENDIX A
ARMY AUTOMATED LOGISTICS SYSTEM

APPENDIX A

ARMY AUTOMATED LOGISTICS SYSTEM

1. LOGISTICS ORGANIZATION. The organization for Army logistics[1] is composed of the following three major segments, each a part of the overall system:

a. The continental United States (CONUS) wholesale segment—the agencies which procure, store, and distribute materiel and supplies for the Army worldwide.

b. The CONUS retail segment—the CONUS numbered armies and the installations within each army.

c. The Army-in-the-Field segment—the overseas commands and the deployable forces in CONUS.

2. VARIATIONS IN ADP USE. At the beginning of the Vietnam era (1 January 1965), the Army had computerized basic supply operations in all three of these segments in varying degrees. Each ADP installation supported basic logistic requirements for a wide variety of equipment with individually designed systems or the following standardized systems:

a. The Standard Supply System (3S) employed centrally developed systems and computer programs on standard, compatible Automatic Data Processing Equipment (ADPE) in the Pacific theater to support basic elements of logistic requirements.

b. The System-wide Project for Electronic Equipment at Depots (SPEED) was implemented by the Army Materiel Command (AMC) in September 1963 at 10 major CONUS depots to accommodate MILSTRIP procedures on the accountable functions of requisition, receipt, and adjustment processing. SPEED used standard systems and computer programs, developed by a central group, on standard, compatible ADPE.

3. CHANGING SITUATION. Until 1 January 1965, operation of standard systems in both CONUS depots and the Pacific theater in a peacetime environment satisfied the requirements of the logistic system in the Pacific area. Immediately following 1 January 1965 and throughout the Vietnam era, sharply escalating workloads saturated the available ADPE capability. Continuous ADPE augmentations and updates were made to satisfy the requirement in both geographical areas.

4. THE ARMY SUPPLY AND MAINTENANCE SYSTEM (TASAMS). Immediately after the formation of AMC on 1 August 1962 as part of the planned reorganization of the Army, study was initiated on the development of The Army Supply and Maintenance System (TASAMS).[2] TASAMS planned for the transfer of accountable supply operations from the depots to the National Inventory Control Points (NICPs), the routing of supply demands directly to the commodity command supply managers, and the standardization of systems, computer programs, and computer hardware at the commodity commands. Consummation of these actions required a 33-month period following approval. During 1963, various developments and considerations required an accelerated schedule of centralization of accountability at the NICPs, and TASAMS

[1] U. S. Department of the Army, Presentation to the Assistant Secretary of Defense (Installations and Logistics), Fort Ritchie, Maryland, Review of Major Automated Logistics Systems, 13-14 September 1968.
[2] U. S. Army Materiel Command, Implementing Plan, Centralization by Commodity-TASAMS, 17 September 1963.

were implemented 1 February 1965 on augmented ADPE with nonstandard systems and computer programs. Experience among the seven commodity commands varied and a 2-month period passed before indicative reliable performance factors were available. In one case, supply performance reports from the computer operation were not available until December 1965.

5. INCREASING WORKLOAD. The increased value of demands, starting in 1965, further aggravated the saturation conditions at the NICPs. Computer capacity was eventually increased through FY 69 by further augmentation of ADPE. In the intervening period, while requisitions increased from a 1963-64 peacetime average of 321,409 per month to a peak of 421,070 per month, an increase of 131 percent, there was a corresponding 458.5 percent increase in priority group 1 and 2 requisitions. Stopgap measures, including manual processing and post-posting to the computer accountable record, were employed.[3]

6. NATURE OF EARLY SUPPORT. During 1965, the demands emanating from Vietnam constituted a completely manually prepared input to a computerized theater system which in turn related to the CONUS wholesale system. Stovepipe systems, special programs, parochially instituted routing and special arrangements, together with crash programs to augment ADPE in all areas, contributed to the improvement of supply performance. However, in many cases problems were created in ADP processing which required solution. The low point of one edit cycle in a month at one installation gradually increased to sufficient edit cycles in FY 69 at all installations to meet MILSTRIP requirements.[4]

7. INCREASING AUTOMATION. When 3S systems and equipment were installed at the U. S. Army in Vietnam (USARV) Inventory Control Centers (ICC) and the Vietnam depots, the problem on manual input shifted to the area of operations below the ICC and depot level. NCR 500 magnetic ledger card systems were installed at the division and nondivision Direct Support Unit (DSU) level to support their operations. Eventually, the mobile ADP equipment of the Combat Service Support System (CS_3) will support the corp and division level of the Army-in-the-Field.[5]

8. ADVENT OF STANDARD SYSTEMS. As a part of the approval process by OSD and the Army, of the request for augmentation requirements of TASAMS in late 1963, AMC was directed to develop standard systems for materiel management to the NICPs, depots and other affected AMC activities. The commodity commands and centers, depots, data banks, arsenals, laboratories and test and evaluation activities of AMC constitute the greater part of the Army CONUS wholesale segment. The balance of the wholesale segment includes the Surgeon General, Army Security Agency, and Army Strategic Communications Command. The National ADP Program for AMC Logistics Management (NAPALM)[6], now known as the USAMC Five-Year ADP Program, was established in July 1964 and subsequently approved by the Army Staff.

9. NATIONAL ADP PROGRAM FOR AMC LOGISTICS MANAGEMENT (NAPALM). The NAPALM program will develop standard systems, operating on standard equipment, within each operating level of the AMC complex, with standard computer programs and software.[7] The NAPALM program is designed to:

a. Improve and facilitate command level direction and response to management requirements of the operating systems in support of the AMC mission. This objective will be obtained by the standardization of the high volume paper work processes required to support the

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[3] U. S. Army Materiel Command, Briefing to the Joint Logistics Review Board, CONUS Supply Performance by Inventory Control Point, 15 October 1969.

[4] Ibid.

[5] U. S. Department of the Army, Presentation to the Assistant Secretary of Defense (Installations and Logistics), Fort Ritchie, Maryland, Review of Major Automated Logistics Systems, 13-14 September 1968.

[6] U. S. Army Materiel Command, FY 1971-1975 U. S. Army Materiel Command Five-Year ADP Program, 30 September 1969.

[7] Ibid.

various operating levels of the command. The design, development, and implementation of these standard systems must ensure proper and effective integration of the operating procedures within and between the responsible organization elements and levels which support a given mission area.

b. Provide AMC with the most advanced automated logistic management system available within the current systems and equipment technology, and to ensure that maximum value is received from the expenditure of effort required.

c. Develop standard systems to support the operational mission in terms of improved processing time, resource requirements, accuracy, and systems discipline and control.

d. Develop and apply methods and techniques for the maximum automation of high volume-repetitive functions exploiting the capability of the equipment for integration and control of such operations.

e. Provide standard documentation to responsible managers at each organizational level to improve and facilitate management control and direction of the AMC standard systems.

f. Ensure adequate controls are developed to provide responsible managers with intelligence to perform appropriate surveillance of the system and to regulate secondary actions processed off-line.

g. Maximize the automation of management decisions to reduce the hard copy output for secondary actions and the requirement for inquiry processes against the operating data base.

h. Assure the application of proper checks and balances for the internal detection, correction, and surveillance of files to identify errors, inconsistencies and omissions.

i. Establish a common, standard ADP data base in support of like functional areas and across NAPALM organizational levels.

j. Minimize file and data redundancy and file maintenance operations through the design and use of the required master file organization.

k. Maximize the equipment capability to accommodate the master file concept through the design, development, and use of Data Management Routines (DMR).

l. Standardize common programs used in all organizational levels and develop methods and procedures to ensure a maximum degree of machine independence.

10. IMPLEMENTATION PLAN. It is planned that the initial and basic logistic computer programs will be implemented at seven commodity commands and three commodity centers by the end of the 4th quarter FY 71. In addition, the present standard depot system will be upgraded by a program titled SPEEDEX (SPEED EXtended) and is planned for operation during FY 71 (Annex 1).

11. COMMODITY COMMAND COMPUTER PROGRAMS. The systems design of the commodity command computer programs provides for many innovations. The following are examples:

a. The cross-referencing of all numbers—manufacturers' part numbers, former stock numbers, substitute stock numbers, interchangeable stock numbers—to the prime Federal Stock Number to eliminate the frequent and voluminous catalog and stock number changes issued to the field.

b. The incorporation of all numbers and their stock data and position in the master record of the prime Federal Stock Number so that supply can be effected on the first computer pass.

c. Daily stratification of stock by account.

d. Computer production of most procurement documentation.

e. Automatic fund certification.

f. Total integration of basic logistic functions within processing frequencies.

g. Automatic release of back orders based on priority and other criteria furnished by the functional manager.

h. Materiel Management Decision Files to permit the use of varying criteria in standard programs for different commodities or commands.

i. Standard file structures.

j. Standard data management routines to eliminate the work of programming the data division of a COBOL application program.

k. Standardization of data elements and codes through the publication of a Data Element Dictionary (DED) cross-indexed to file and system usage.

12. ADDITIONAL AUTOMATED DEVELOPMENT. Additional automated program and system development is underway in both retail segments:

a. CONUS Retail Segment

(1) The Centralization of Supply Management Operations (COSMOS) is designed to test the feasibility of centralizing installation stock control and supply management functions at each CONUS Army Headquarters. COSMOS is an automated retail supply system which performs supply management and stock fund management for a continental army. Development of COSMOS was initiated in June 1965 when the Sixth Army was directed to activate a prototype system at the Presidio of San Francisco. This system, which is operational in the Sixth Army only, is only a prototype at this time.

(a) The main objectives of this system are the reduction of inventory, workload, personnel, and costs at the installation/user level; and the improvement of materiel readiness, supply performance, and reporting at the installation level. Further objectives are more effective use of scarce supply management and ADP skills; increased responsiveness to training needs of overseas commanders; development of an economical and reliable data communications system; and the improvement of budgeting, funding, accounting, and reporting performance.

(b) For the Sixth Army Stock Control Center (SCC), the equipment configuration consists of an IBM System 360-30 central processing unit (65K core capacity) with card reader/punch, printer, and two tape transports, and an IBM System 360-40 central processing unit with card reader, eight tape transports, and a direct access storage facility to be shared between the two central processors. The functions of the IBM S/360-30 are to service inquiries from remote devices located within the SCC, handle communication traffic to and from the five Class I installations within Sixth Army, and to perform card reading, card punching, and printing. The 360-40 is the main processor which performs the edit of transactions, updates files, and prepares output report information normally performed by a free standing central processing unit in logistics operations.

(c) The Stock Control Center Field Offices (SCCFOs) are equipped with basic punch card devices - collator, interpreter, and reproducer and a terminal which allows communication traffic via AUTODIN.

(d) The COSMOS system includes the following significant features:

1. Lateral redistribution or transshipment permits materiel in long supply at one location to be quickly applied against requirements of another station. This is made possible by the capability of the computer to rapidly screen all assets before passing action to the wholesale system.

2. Flexibility in effecting management decisions is greatly expanded since the COSMOS system provides one-day feedback data.

3. In the event of limited consumer funds, controls can be speedily set which would permit processing of high priority requests while routine demands or other actions, as designated by the installation commander, are delayed pending receipt of additional resources.

4. An automated data bank will provide management information pertaining to each stock item and each transaction.

5. COSMOS will eliminate or greatly minimize manual efforts by automating the review and maintenance of records, data summarizing, computation of costs and adjustments, and the preparation of reports and detailed documentation to support reports and billings.

(2) The CONARC Class I Automated System (COCOAS) is designed to automate and standardize management functions, such as personnel, finance, and facility management of the Class I installation management system. The COCOAS concept envisions a base-level management information system designed to meet all management and reporting requirements at installation level. The original COCOAS project provided for development, implementation, and maintenance of standard ADP programs and equipment configurations at Class I installations within CONUS. COCOAS is intended to fulfill the requirements for standard information and data systems at base level and also form the integrated data base for vertical management at all levels of command.

(a) COCOAS Organization. The COCOAS project was initiated by the Continental Army Command (CONARC) in 1965 to standardize the multiplicity of ADPE programming systems, and management/reporting procedures in use throughout the CONUSA's. The COCOAS project plan established five distinct phases.

1. Phase 1. Preparation and submission of system specifications, selection of ADPE, and installation of the equipment configuration at the developmental prototype installation. Phase 1 was completed in 1967, with the following results:

a. Selection of the versatile third-generation IBM S/360 F30 disk-operating system as the standard COCOAS configuration.

b. Establishment of a COCOAS prototype installation at Fort Sill, Oklahoma.

c. Establishment of a developmental "test bed" computer facility (Support Group) at Fort Eustis totally dedicated to COCOAS development.

2. Phase 2 (Now in Progress). Design, development, and operation at the prototype installation of initial standard systems: Military Personnel Management System, Financial Management System, and administrative management of USCONARC schools

(CONEDS). While CONEDS remains within the COCOAS concept, it has been designated command-unique and assigned to HQ CONARC for project management.

3. Phase 3. Extension of initial standard systems to 35 Class I installations within the CONUSA's.

4. Phase 4. Design, development, and test of additional applications within the initial systems and the selection, design, development, and test of additional systems.

5. Phase 5. The phased extension of follow-on applications and systems to all operational COCOAS installations.

(b) COCOAS Objectives

1. Improved Readiness. The fundamental objective of COCOAS is to improve the readiness posture of units under USCONARC control and be responsive to the informational requirements of all unit commanders, provide all commands with accurate and timely data to enhance decision making, and provide timely administrative and supply support to obtain maximum effectiveness from available resources including meeting the established time frames for supply responsiveness stated in AR 711-16 and AR 725-50.

2. Standardization. A prime objective is the design and implementation of standard systems for Class I installations, achieving accurate, timely, and uniform reporting; uniform and rapid response to directed system changes and the most economic techniques for implementation of changes; reduction of on-the-job training requirements for newly assigned employees, especially rotating military personnel; maximum efficiency in employment of personnel and all ADP resources; simplified implementation during extension period; and an opportunity for ADPE time sharing between Class I installations.

3. Integration of Systems. All systems will be designed to permit the maximum use of source data through systematic organization of all related functions. Benefits anticipated from an integrated system are as follows: minimal processing of paper work; a minimum number of records maintained; adequate internal control established; accurate management reports based upon management by exception available in sufficient time for effective decision making; reduction in data conversion achieved by automatically incorporating data between systems.

4. Management by Exception. All COCOAS reports will be produced on an exception basis; normal operating actions within permissive parameters established by functional area will be computer handled. All reports will be confined to regulatory requirements or exceptions requiring management decisions.

5. Other Objectives

a. Increase mobilization potential by providing built-in systems retrenchments to bypass processing actions that can be deferred in emergencies; achieve a reservoir of trained personnel CONUS-wide to assist any station faced with the short term "brush fire" emergencies; provide alternate site capability by having compatible ADPE and systems at multiple sites.

b. Provide additional data processing support in areas not mechanized at the present time because of the limitations of present equipment.

c. Accomplish workload increases through extended mechanization with minimal personnel additions.

d. Provide for effective monitorship of resources used in relation to mission accomplishment by means of work measurement techniques and production control procdures.

e. Respond to managers' needs by providing quick response to inquiries concerning specific items and the rate of program accomplishment.

f. Conform to standard Government, Defense, and Army systems, informational requirements, and regulatory constraints.

(3) The Army is in the process of comparing COSMOS versus the COCOAS supply application, including other alternatives The objective is to determine which supply management system will be adopted as standard for the CONUS retail segment. It is recognized that either system, and various alternatives thereto, will provide for an effective supply system, but the spectrum of inherent advantages and disadvantages varies between systems. Also, there are significant cost effectiveness differentials to be considered. COCOAS, which is a multifunctional system, will eventually be installed at 35 CONUS installations, with or without a supply application. The final decision on the standard ADP supply application (COSMOS/COCOAS/Alternative) is anticipated in March or April 1970.

b. Army-in-the-Field Retail Segment

(1) The Combat Service Support System (CS_3) provides van-transportable ADPE to support the corp and division level. The basic objective of CS_3 is to increase the responsiveness of combat service support to the requirements of the Army-in-the-Field through the judicious application of ADPE.[8]

(a) CS_3 is an integrated system of functional components called subsystems. Each subsystem is a separate entity; however, the subsystems are centrally controlled and use common processes and data files when practicable to use time and equipment most efficiently. The system lends itself to expansion. The following four subsystems comprise the current CS_3 configuration.

1. Supply includes Classes II, III (packaged), IV, VII, and IX; property book records keeping; Army Equipment Status Reporting System (AESRS); supply financial management; and demand analysis in the initial phases of system development.

2. Maintenance Reporting and Management (MRM) includes a materiel readiness reporting system which replaces TAERS inputs from CS_3 equipped units.

3. Personnel and Administration (P&A) includes strength accounting and reporting; personnel requisitions, allocations, and assignments; and personnel records keeping. It also provides data for interface with the Joint Uniform Military Pay System-Army (JUMPS-Army) and the Army Personnel Reporting System.

4. Medical includes patient accounting, reporting, and regulatory control over the movement of patients between various medical treatment facilities.

(b) While meeting the tactical needs of the commander it serves, CS_3 is designed to enhance the effectiveness of combat service support at all echelons. CS_3 utilizes standardized inputs and outputs that are compatible with DOD standards, Army Regulations, and other DA procedural guidelines. In addition, personnel trained in combat service support functions at one level can operate at any level with minimal additional training. Tactical commanders are provided with up-to-date information through scheduled, requested, or exception reports on status of supply, materiel readiness, unit personnel, and medical facilities. Operators and managers of CS_3 receive special reports designed to enable them to manage their assigned logistical, personnel, and administrative functions better. Tactical unit users are served by a centralized stock accounting system which materially reduces their record keeping task and will increase the probability that supply items will be available to satisfy unit demands.

[8] U.S. Army Computer Systems Command, Introductory Manual Combat Service Support System (CS_3), June 1969.

In addition, the personnel and administrative work load at the unit level is greatly curtailed by reduction of the unit record keeping and reporting requirements. Reports generated routinely by the computer relieve the clerical burden at all levels. The following specific objectives apply for each of the CS3 subsystems:

1. Supply

a. Improve supply responsiveness to supported units.

b. Reduce errors in supply transactions.

c. Improve utilization of materiel.

d. Provide selected stockages in forward areas.

e. Improve mobility of direct support (DS) and general support (GS) units.

f. Improve the accumulation of supply costing documentation in order to provide sufficient, timely, and accurate information to facilitate decisions concerning supply funding requirements.

g. Reduce the manual effort required to maintain property books and prepare reports required for the AESRS.

2. Maintenance Reporting and Management

a. Improve the responsiveness of maintenance reporting to meet the requirements of local commanders and managers.

b. Reduce the errors in maintenance reporting.

c. Reduce the administrative work load related to maintenance reporting.

d. Satisfy the requirement of the national level data bank.

3. Personnel and Administration

a. Improve the transportability of personnel records.

b. Improve the accuracy of personnel records.

c. Improve the availability of personnel data and the capability of locating critical skills.

d. Reduce the effort required to prepare personnel reports and maintain records.

e. Increase the efficiency of personnel requisitioning.

f. Improve personnel allocations and assignments.

g. Decrease the time and effort required to assign personnel.

h. Provide timely and accurate input data to JUMPS-Army and to the Army Personnel Reporting System (through the Army data processing activity) as a by-product of P&A daily processing.

4. Medical

a. Improve utilization of professional personnel and medical facilities.

b. Reduce administrative work load at medical installation related to medical reporting.

c. Improve the response and processing times for critical elements of information.

d. Improve patient locator service.

e. Improve utilization of specialized medical facilities.

f. Improve the accuracy of medical reporting.

g. Decrease the amount of information that must be filed and processed manually.

(c) When development is completed and the extended system is installed, CS3 will provide a fully integrated computer supported logistics, personnel, and administrative system for the Army-in-the-Field. The above description reflects the configuration of CS3 as the system was designed including approved modifications. The prototype of CS3 is undergoing test and evaluation in a two-division corps environment at Fort Hood, Texas.

(d) Pending the completion of the ongoing CS3 tests at Fort Hood, the Army has developed an interim ADPS for installation in Army divisions. This system is designed to utilize UNIVAC 1005 card processors, and functional applications are confined to supply operations, asset reporting, accounting, and maintenance management. The title of this system is DLOGS (Division Logistic System). Installation of the interim system in all Army divisions is planned by November 1970.

(e) The Army visualizes there will be a continuing need for the NCR 500 systems to support supply operations of the independent nondivisional direct support units deployed in areas behind combat divisions. However, there is a recognized need to upgrade the ADP capabilities of small user oriented computers like the NCR 500, and overcome the inherent disadvantages of the magnetic ledger card system. In essence, the Army desires to retain the small-scale user-oriented computer at the lowest levels which must be capable of independent support operations, and concurrently provide for automated reporting to higher levels where more sophisticated ADPE is used for data processing of management information and to satisfy the multiplicity of reporting requirements.

(2) The Theater Army Support Command (TASCOM) system will provide standard systems worldwide for the theater support level. The Army-in-the-Field segment of the Army logistic support structure includes the theater support level which is essentially the offshore logistics base overseas. Development of standard automated systems for this level was initially assigned a second priority to the system (CS3) being developed for the corps and division levels. Both the Pacific and Europe theaters presently have adequate ADPS that preceded the plan for standard systems under the CS3 program.

(a) Under CS3 the ADPS for the theater support level would be tailored to the individual functional commands, e.g., Materiel Command (MATCOM), Engineer Command, Transportation Command (TRANSCOM), and Personnel Command. This differs from the multifunctional approach for CS3 automation at the corps and division levels. Planning is underway for development of the ADPS for MATCOM and TRANSCOM.

(b) Major changes to the Army logistic support structure are being considered which could result in drastic realignment in materiel management at the overseas

theater level. These changes, if adopted, will necessitate redirection of the efforts for the standard ADPS and may confine the requirement to a system for field depots only. Final decision on this matter is contingent upon a test of direct delivery techniques (from wholesaler to customer) which is scheduled to begin on 1 July 1970.

13. CENTRAL DESIGN AGENCIES. The Army established the Automated Logistics Management Systems Agency in St. Louis, Missouri, on 19 June 1967 as the central systems design agency for the wholesale segment of the Army automated logistic system. The Computer Systems Command was established at Ft. Belvoir, Virginia, in March 1969 as the central systems design agency for the retail and Army-in-the-Field segments of the Army automated logistic system.

14. STUDY OF FUTURE INTEGRATION IN ARMY LOGISTICS REPORTING. To ensure that the various horizontal operating systems under development provide a cohesive and usable vertical Logistic Management Information System, the Army has conducted a design project supported by the Stanford Research Institute. The objective is the establishment of an Integrated Supply, Maintenance and Materiel Readiness Reporting System from unit level up through intervening echelons to headquarters, Department of the Army. Phase I of the study identified the essential elements of information required for management and decision making at each echelon of the Army, Phase II covered system design of the structure, organization, procedures, management indicators, and the data base for management at each echelon. The system provides for the collection, processing, and storage of management data and output to management at all echelons. It has been designed to obtain this information from data banks supporting the horizontal operating systems under development. Data bank input come from reporting units in a "tap-the-source-once" report. It is the Army's intention that this effort will result in a standard worldwide information system which will integrate supply, maintenance and materiel readiness reporting into a single cohesive vertical system.[9]

15. SUMMARY. The experience of the Department of the Army during the entire Vietnam era brings into focus a number of salient points which have influenced the Army program for providing ADP support to logistics operations and management.

a. The lack of ADPE in-country during the first year influenced the development of mobile ADPE of the Combat Service Support System (CS3) which will be available for future deployment.

b. The absence of standard systems in many areas illustrated the need for the establishment of the Automated Logistics Management Systems Agency in the wholesale segment and the Computer Systems Command in the retail and Army-in-the-Field segments as central system design and programming agencies.

c. The shortage of ADPE capability in CONUS will be corrected by the installation of standard equipment under the NAPALM program.

d. Automated interface between overseas theaters and CONUS will be provided by the Theater Army Support Command standard systems worldwide for the support of theater level operations.

e. The decentralized and nonstandard production of management information will be replaced by the Logistic Management Information System to provide a cohesive vertical information system for all echelons from unit to headquarters level.

[9] Stanford Research Institute, Menlo Park, California, Part II, System Design, Volume I, Executive Summary, prepared for U.S. Army Research Office, Arlington, Virginia, Contract DA-HC19-67-C-0023, An Integrated Materiel Readiness, Supply and Maintenance Management Information System, September 1968

ANNEX A1

PROJECT SPEEDEX (SYSTEM-WIDE PROJECT FOR ELECTRONIC EQUIPMENT AT DEPOTS — EXTENDED)

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PROJECT SPEEDEX (SYSTEM-WIDE PROJECT FOR ELECTRONIC EQUIPMENT AT DEPOTS – EXTENDED)

1. BACKGROUND

a. A major portion of the AMC ADP program is directed to continuing standardization of depot operating systems. Ten major AMC depots have been operating standard ADPE (IBM 1410/1401 computer configurations with immediate access capability) and are using standard programs and procedures centrally maintained by the USAMC Logistic Systems Support Center (LSSC), Chambersburg, Pennsylvania. This major standardization effort is referred to as the System-Wide Project for Electronic Equipment at Depots (SPEED) and has been in operation within the AMC depot structure since September 1963.

b. In January 1966, AMC determined that the requirement for computer support by depot and headquarters activities had increased to the extent that exchange of ADPE installed under Project SPEED was required. As a result of this determination, Project SPEEDEX (SPEED EXtended) was established and two additional installations were added to the family of standard depots.

2. CONCEPTS

a. SPEEDEX incorporates several new concepts of operation and enlarges upon many of the concepts employed in SPEED. Under SPEED the feasibility of immediate access computer storage proved highly successful for support of depot operations. Under SPEEDEX, employing third generation Control Data Corporation 3300 series computer configuration, expansion of immediate access type files, will permit greater volumes of data to be more efficiently processed and readily available with an attendant reduction in the cost of this type storage.

b. SPEEDEX will increase both the use and number of remote input and output devices to be located in various operational sites of the depots to improve and accelerate the transporting of data between depot using organizations and the computer activity.

c. The rapid information distribution and retrieval concepts of SPEEDEX coupled with an Installation Management Information System designed to provide management data, to be available on an immediate call basis rather than on a historical mass report system, will enhance the responsiveness of the depot's day-to-day decision-making process, by providing information within a time frame that will permit timely, decisive corrective action.

3. SCOPE

a. SPEEDEX embraces all areas of depot operations and includes 22 systems applications. For purposes of systems development and orderly implementation at each of the 12 SPEEDEX depots, these applications have been categorized into two groups, i.e., hardcore applications and hardcore follow-on applications.

b. In the hardcore applications group are all activities relating to the depot distribution mission and in the hardcore follow-on applications group, maintenance production, planning and control, quality assurance, and all depot support and overhead activities are encompassed.

4. SYSTEMS INSTALLATION

a. SPEEDEX will be installed at a prototype depot beginning in 4th quarter FY 70. Installation at the remaining participating depots is scheduled for 3rd and 4th quarters FY 71.

b. Additionally, during 1st quarter FY 71, a test to determine the feasibility of "satelliting" for systems purposes a small non-SPEEDEX depot onto the computer at a SPEEDEX prototype depot will be initiated, utilizing remote terminals at the non-SPEEDEX depot and by subscribing to a commercial communications facility which will provide circuit availability as needed to meet operational demands of the system.

5. SUMMARY

a. SPEEDEX, an integral part of the overall AMC standardization of systems effort, will incorporate many new depot management concepts as well as expand on those concepts established under SPEED.

b. SPEEDEX not only represents utilization of a third generation computer, it also represents use of third generation techniques in systems design and improvement of functional procedures to ensure availability of information needed for effective management and efficient operations.

c. The SPEEDEX computer configuration will provide greater capability for internal (depot) real-time processing. Remote stations throughout the depot will be equipped with a variety of input/output processing media to provide timely response to requirements for documentation and information.

APPENDIX B
NAVY AUTOMATED LOGISTICS SYSTEM

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NAVY AUTOMATED LOGISTICS SYSTEM

1. BACKGROUND. Prior to 1961, the Navy Supply System was not one system but a collection of independently functioning systems tailored to support the peculiarities of the individual Inventory Control Points (ICPs) exercising control over various commodity groupings (ordnance, electronics, and aviation). At that time each of the inventory managers was allowed considerable latitude in supply systems design and selection of the ADP hardware needed to support the ICP functions. This latitude resulted in a diversified number of reporting techniques, codes, and nonstandard formats required to interface with other ICP and stock point systems. Because of ADPE limitations, the ICPs generally relied on quarterly asset, demand, and requirements reports submitted from stock points and reacted after the fact to purchase or redistribute stocks. With no single data bank to work with, the ICPs had many separate (and partially duplicate) tape files that were merged to accomplish various functions. Keeping these files updated was a major task. The accumulated deficiencies in the then-current system mandated a major overhaul in supply systems design in order to achieve consistency in the conduct of ICP day-to-day business. Upgrading equipment and standardizing both hardware and procedures was the solution.[1] The design concept was to develop a real-time system using the most advanced computer hardware and the most sophisticated mathematical decision rules which would be responsive to requirements of the Department of Defense, the General Accounting Office (GAO), and other high management levels.

2. MANAGEMENT RESPONSIBILITY. Navy management of inventory items is the responsibility of three ICPs: the Aviation Supply Office (ASO) at Philadelphia, Pa.; the Electronics Supply Office (ESO) at Great Lakes, Ill.; and the Ships Parts Control Center (SPCC) at Mechanicsburg, Pa.[2] Policy and guidance governing the Navy-wide inventory control system is formulated by the Navy Supply Systems Command and is implemented by a centrally designed and programmed Uniform Automated Data Processing System (UADPS).[3] Three levels of supply management--ICPs, stockpoints, and ships--are linked by UADPS into an integrated system.[4]

3. UNIFORM AUTOMATIC DATA PROCESSING SYSTEM AT INVENTORY CONTROL POINTS (UADPS-ICP). In January 1962, a task group was established, comprised of the best personnel available in the Naval Supply System Commands.[5] The group was tasked to develop a total system concept for supply management, outline program and operational concepts, and recommend methodology and schedules for system installation. Accordingly the UADPS-ICP was designed to accumulate and maintain files of technical, inventory, and management data pertaining to centrally managed items of supply and, by use of these files, to generate immediate or periodic automated decisions relating to procurement, repair, issue, redistribution, and disposal of the items. UADPS-ICP was also designed to perform by automation all repetitive inventory manager operations previously done manually or by punched card equipment, thus conserving time and manpower and making available management expertise previously engaged in these manual processes. The system design also provided for automated preparation and

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[1] Design Conference of Systems Command and ICP Personnel, 14-16 Nov 1961.

[2] U.S. Department of the Navy, Office of the Secretary, Publication NAVSO-P1500, Navy Policy and Standards for Supply Management, 25 May 1968.

[3] Ibid.

[4] Secretary of the Navy Instruction 4440.28, Uniform Inventory Management System; Development of, 25 April 1963.

[5] U.S. Navy Bureau of Supply and Accounts, Letter, Permanent ADP Capabil ty Committee; Establishment of, 30 October 1961.

update of load and allowance lists and for control and automatic input of the provisioning process and its results. Further, it was designed to serve all levels of supply management. While UADPS-ICP is an inventory manager system, the companion UADPS for stock points and UADPS for selected afloat units have been designed for compatibility through the use of Military Standard communication formats. Although computer compatibility is limited, the standardization of input and output results in a high degree of extension and expansion potential, limited primarily by functional differences between activities.

4. DEFINITION OF SYSTEM REQUIREMENTS. The system requirement for ADP applications, and the methods, personnel, and equipment required to achieve the desired end results are defined as follows:

a. Establishment and maintenance of highly integrated inventory and technical data files that are jointly updated through real-time and batch processing action; thus providing for minimum redundancy and improved accuracy and currency of data.

b. The capability for immediate automated response in receiving and handling all high priority requisitions.

c. The capability to daily batch-process all low priority requisitions received by an ICP.

d. Automated processing of all supply directives generated by an ICP.

e. The capability to concurrently perform supply demand review for all applicable stock items and also compute reporting activity system requirements.

f. Daily automated matching and reconciliation of reporting activity and ICP balances.

g. Immediate response to direct inquiries for current inventory status and selected technical information.

h. Immediate availability of inventory and technical data for use in selected ADP programs, and routine availability (within 24 hours) of data in all other files.

i. Facilities for direct hook-up with high-speed communication networks to accept or transmit data and/or messages.

j. Automated preparation of purchase requests and/or purchase documents, provisioning requirements, load lists, allowance lists and similar documents.

k. Capabilities to compute and/or accumulate statistical, financial, historical, and other similar data generated by various ADP processes.

5. <u>SPECIFICATION FEATURES.</u> On 1 July 1962, all known computer manufacturers were sent a comprehensive set of specifications describing the overall program and requesting the submission of bids. The following specific features were incorporated in the specifications:

a. One single master data bank with no redundancy.

b. All data instantly retrievable from remote devices.

c. Real-time processing of requisitions.

d. Real-time file update from transaction reports.

e. Daily supply demand reviews.

f. In-transit controls (suspense actions).

g. Repair scheduling.

h. Maintenance and publishing of catalogs.

i. Automatic disposal.

j. Centralized retention of backorders with real-time release on receipts of assets.

k. Daily automated purchases with contract administration.

l. Quarterly levels establishment and stratification.

m. Elaborate Weapons System Files with allowance list buildup upon call.

6. COMPUTER SELECTION. Only one supplier adequately met the requirements. The UNIVAC 490 computer was selected on 26 November 1962. At that time, the initial portion, the "Inventory Control Series" of programs was scheduled for implementation on 1 July 1964. It was estimated that total computer time for this series would absorb only 250 hours per month.

7. PERSONNEL CONSTRAINTS. With the selection of the hardware, analysts and programmers were sent to the manufacturer's school to learn how to handle the new equipment. It was found that no other user nor the manufacturer had yet had experience in designing a system as large or as comprehensive as the one planned. Learning curves were long. Many of the programmers and analysts considered extremely competent in program development for sequential processing could not comprehend a real-time environment. The hiring market offered no help. In-house training of personnel was the only answer.

8. DEVELOPMENT SITUATION. In any discussion of the strength and weakness of the UADPS-ICP system it is important to recognize two major conditions. First, the system has been pioneering and advancing the state of the art in its complexity and sophistication primarily in three areas: real-time processing, comprehensive systems approach, and excellence of mathematical decision rules. Secondly, there has been an unparalleled era of change in environment, far more than had been anticipated, and to which the system design had to respond. Initially, it was intended to segment individual programs and divide the workload among the ICPs. File layout and addressing conventions would be monitored by a small group of experts under a field office located in Mechanicsburg, Pennsylvania. This did not work. In addition to the problem of trying to exchange all the necessary data between interfacing functions with workers decentralized, problems were inherent in using ICP analysts and programmers located at the ICPs. Operational problems were allowed to preempt their time, and little or no progress was being made on UADPS-ICP tasks. As a result, target dates slipped in all areas and it was necessary to regroup. Accordingly the ICP analysts and programmers assigned to specific functions were put on a travel status and centralized as a task group at the Mechanicsburg Office. This effort began to show immediate dividends. Consequently, the task group was given permanent status and established as an integral part of the Fleet Materiel Support Office, Mechanicsburg, Pennsylvania, in July 1965.[6] Here again some ground was lost since many of the personnel declined to transfer. However, the impetus gained from the establishment of a central computer design organization far outdistanced the loss. As the individual programs began to meld together and the overall program began to take shape, new problems developed:

a. The need for additional data and computer core expanded.

b. As management discovered new data were becoming available, more information was demanded, consequently new programs were added.

[6] U.S. Navy Bureau of Supplies and Accounts, Letter, UICP Program; Central Maintenance of, 11 January 1965.

c. New Department of Defense programs (Military Standards) and revisions to existing programs overtook events and programs had to be rewritten before they reached test stages.

d. File layouts began to explode, absorbing computer capacity.

e. Experience during testing showed that many computer failures caused loss of data. Therefore, an entire new series of recovery programs and techniques, including the development of complete audit trails, were developed. This slowed down the computer throughput and occupied more of the computer capacity. The total system concept of a single data bank had to be compromised to place selected programs on supporting tape files in order to limit costs and stay within program, ADPE capacity, and time limitations.

9. SYSTEM IMPLEMENTATION. The first operational UADPS-ICP program was implemented at ESO in October 1965. This was the real-time requisition processing program. The Basic Inventory Control Series, consisting of seven major programs plus some miscellaneous programs, all operating from a single master data bank, was implemented 6 July 1966 at SPCC. As experience was gained in operation at the SPCC, it was found that the system processing times exceeded original estimations. Until UADPS-ICP there was no military or commercial activity running a similar real-time computer system from which estimates of running times could be obtained. Until the UADPS-ICP was operational actual running times could not be observed although the times and the volumes expected at the ASO indicated that the entire Inventory Control Series could not be run at that installation.[7] Therefore, certain of the programs were backfitted to eliminate some of the frills and speed up throughput. As a result, ASO converted to the program on 1 January 1967. ESO followed in April of 1967.

10. OPERATIONAL SITUATION. Once in an operational environment, new problems developed between the ICPs and the reporting stock points.

a. Reaction turnaround times at the ICP were much faster than the reporting stock points (ICPs were posting daily and responding immediately to reports that were up to 7 days old).

b. Since ICPs were processing much faster and had better control, many problems which were hidden or self-compensating under the old management systems (quarterly reports) could not be tolerated in the new environment.

c. The sophisticated system for quality control that edits all field input, detected errors that previously went undetected. Rejects returned to the field for correction climbed to significant proportions. Although the quality control remains unchanged, many of the errors now are processed and summarized using a "report card" technique in lieu of card-for-card notification.

d. The complexity of the new computers required an extended period to effect maintenance (revisions) to operational programs. The interface between real-time programs, master data files, and audit trails while operating in a concurrent mode required extensive review, test and checkout.

e. Operator training was extensive. Only highly qualified personnel could be effectively employed to analyze program faults and effect recovery quickly and correctly.

f. It became obvious that it was highly desirable that the analyst and programming staffs be positioned adjacent and have adequate access to a computer for test and debugging operations.

g. The software package offered by the manufacturer required expansion.

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[7] U.S. Naval Supply Systems Command, Letter, UICP ADPE Capacity, 11 March 1968.

11. REFINEMENTS TO MANAGEMENT PROCESS. None of the above problems were insurmountable. Most have been resolved. However, Navy experience in the development of the UADPS-ICP program points out several weaknesses in the management process. To get better results faster in the design of a new system it is necessary to consider in advance:

a. How big a "bite" should be taken? Is a major overhaul worth it, or would an incremental approach to a new system serve better?

b. How responsive should programs be? Immediate/slow/medium speed data accessing requirements must be recognized and defined.

c. How accurate should records be? What is the trade-off between quality control and over-control?

d. How can the following be better estimated?

(1) Computer capacity requirements

(2) Programming, test and debugging times

(3) Human resource requirements

(4) Trade-off between economic computer utilization and program simplification.

12. CHANGING ENVIRONMENT. Concise and explicit statistical comparisions of the pre-Vietnam era with the Vietnam era are virtually impossible. The environment of Navy inventory management was drastically altered by a combination of circumstances such as the changes in items managed, the conversion to Military Standard procedures, and the consolidation of Navy inventory managers as well as the implementation of UADPS-ICP concurrently with the SE Asia buildup. The mix of items managed by the Services has undergone dramatic change during the Vietnam era. Transfer to DSA and GSA have been biased toward items of a relatively easy-to-manage nature (low cost-high movement) while new items added to the Navy managed inventory have been increasingly complex and expensive.

13. ROLE OF ADP IN SYSTEM EFFECTIVENESS. During the Vietnam era many conditions were acting to erode Navy supply support effectiveness: increasing complexity of management, austere funding, increased tempo of operations, diversion of resources in response to increased emphasis on program and weapon system support, and continual change. In the face of these factors the inventory managers have managed to maintain their performance levels relatively well. This is due primarily to the success of the UADPS-ICP and UADPS-Stock Points automated system. Without the implementation of this improved highly mechanized ADPS, it is virtually certain that severe adverse effects on our support of SE Asia operational forces as well as our fleet routine peacetime operations would have occurred.

14. ADP RESPONSE TO CHANGING CONDITIONS. The most severe impact directly attributable to Vietnam activity is shown in Table B-1 below. Particularly significant is the continuing change in proportion of Issue Priority Groups I and II from about 13 percent pre-Vietnam to about 68 percent in FY 69.

TABLE B-1

NAVY REQUISITION DISTRIBUTION (%) BY ISSUE PRIORITY GROUP FOR SELECTED YEARS

IPG	FY 63	FY 65	FY 69
I	1	2	29
II	12	14	39
III	45	54	23
IV	42	30	9

Source: U.S. Naval Supply Systems Command Publication 295, Inventory Control Operations at Supply Distribution Activities, 1963-1969.

During the period total requisitions processed increased significantly and the workload would have been severely backlogged except for the UADPS-ICP programs. Requisitions received and processed by ICPs nearly doubled between 1965 and the 1967 peak partly due to the centralization of backorders and partly due to the Vietnam buildup.[8] Since then, decreasing SE Asia volume and DSA/GSA item transfers have resulted in a downward trend in volume of requisitions processed at the ICPs. Without the ICP requisition processing programs the peak workload could not have been handled in accordance with the time frames required to maintain fleet operations.

15. COMPUTER EXPANSION. The UNIVAC 490 was selected on 26 November 1962. Delivery began in early 1964. By 1968 it had become obvious that increased aspirations for the UICP management package and the changing environment required significant additional hardware. Approval was received for conversion to UNIVAC 494s. The first of these was installed in 1968. Total dollar expenditure on UADPS-ICP hardware over the 1965 to 1969 time frame has grown from just over $1 million in FY 1966 to a forecasted $5.8 million for FY 1970 (based on 4 months actual and planned changes). This growth reflects the increased implementation of ICP programs. Inventory management use of other ADP hardware has been reduced during this period as ICP standard programs replaced earlier unique programs run on the UNIVAC II, IBM 1410 and IBM 7080 hardware previously used for these functions. The Fleet Material Support Office has the responsibility for design analysis and programming of UADPS-ICP. Personnel requirements have been relatively level during the Vietnam era.

16. FUTURE SYSTEM MODIFICATION. No dramatic internally generated changes in the UADPS-ICP concept, procedures or hardware are presently being considered for the early 1970s. The Supply Systems Command recognizes the probability of externally imposed changes which will require changes and adaptation in response. Nonetheless, current planning is to invest available resources primarily in a consolidation and refinement effort during the next few years. One primary objective is to carry on and complete full scale implementation of the entire UADPS-ICP package. The Weapons System/Fleet Support subsystem is not in operation at ASO or SPCC and is not yet fully implemented at ESO. This system must be extended to fully operational status. Some problems have arisen in random access storage capacity at ASO and SPCC which must be resolved prior to full scale implementation to this operation. The present outlook is optimistic. It appears that a shift from drum to disk storage will provide adequate capacity without necessity for increased military construction expenditure and at the same annual cost as is presently budgeted.

[8] Lieutenant Commander John M. Cook, USN, Naval Supply Systems Command, Interviews, January 1970.

17. FUTURE HARDWARE SITUATION. It is anticipated that the current hardware system will be in use throughout the early 1970s. Some changes in configuration and/or peripherals may be required. Present efforts to convert to the COBOL Language (providing significant hardware independence) are expected to be complete prior to the next major system change. The major 3- to 5-year goal is to complete the original UADPS-ICP plan, to implement all subsystems at all ICPs, and to make such changes and refinements as are required to respond to the changing environment and requirements.

18. REVIEW PARAMETERS. As this appendix has focused on review of the UADPS-ICP, it has addressed other systems only in relation to their interface with the UADPS-ICP. Therefore, ADP in-country, shipboard, or at the Naval Supply Depots in the Western Pacific (WESTPAC) are not directly addressed.

19. SUMMARY. In the development and successful implementation of the UADPS-ICP several lessons were learned:

a. ADPS design and development for multi-installations comprising a total functional system should be accomplished by one activity.

b. Multi-installation systems should be designed with uniform ADP equipment, i.e., identical central processing units with allowance made for variance in auxiliary and peripheral equipment with the requirement that standard computer programs will operate on all configurations.

c. Allowances should be made for expansion in volumes of data to be processed as well as unpredictable ADP requirements at the time of development of the system specifications for the acquisition of ADPE.

d. Active participation by functional managers in all aspects of system design, programming, testing, and operation must be recognized and enforced.

APPENDIX C

MARINE CORPS AUTOMATED LOGISTICS SYSTEM

APPENDIX C

MARINE CORPS AUTOMATED LOGISTICS SYSTEM

1. EARLY ORGANIZATION FOR ADP SUPPORT. The first logistic support element to enter Vietnam in support of Marine Forces was a Brigade Logistic Support Group (BLSG) which was formed on Okinawa and deployed to Da Nang, Vietnam, during March 1965. Data processing equipment and personnel were included with the deployed forces. Maintenance, supply, administrative, and data processing elements of the BLSG were formed from the 3d Service Bn, 3d MARDIV, Okinawa. These units had been operating as an integrated organization prior to deployment and as a result, procedures, systems and card files were established and operational as standard operating procedures (SOP).

2. INITIAL PROCEDURES. The standard Fleet Marine Force (FMF) supply system supported by ADPE was an offset card system. Under this system, requests for materiel were manually screened against a balance card file. Resulting action was recorded in transaction cards, offset behind applicable balance cards, and processed by ADP program and procedures to update as required, compute Reorder/Reorder Point (RO-ROP), and generate replenishment requisitions for forwarding to the supply source on Okinawa. Materiel and balance cards comprising shop stores and mount-out blocks were consolidated to establish the BLSG stock account.

3. EQUIPMENT PROBLEMS. Equipment consisted of an IBM 1401-B3 card computer and related Electronic Accounting Machines such as sorter, collator, interpreter, and key punch units. Equipment and supplies were contained in four air conditioned, M35 mounted, M109 vans and powered by two 60KW, trailer-mounted generators.[1] Problems encountered during the early months of deployment were exactly the same as those experienced during the garrison operation on Okinawa; however, the effects were amplified in several instances. Heat, dust, and humidity, the prime factors subject to environmental control, were more evident in Vietnam causing a greater rate of wear on equipment with a resulting increase in equipment failures. Downtime was excessive owing to lack of equipment backup, long lead time to obtain parts, and delay in obtaining technical assistance. These problems were eased by October 1965 by the deployment of two additional ADPE platoons, repairmen, and the establishment of communication and transportation arrangements to obtain needed replacement parts.[2]

4. THE BUILDUP. As additional forces were deployed to Vietnam, the supply system applied became inadequate. Multiple stock accounts and locations could not be effectively screened by a centralized manager to provide cross support between accounts and the volume became too burdensome under the manual processing methods. An ADP study was made in August 1966 which resulted in plans for an upgraded system supported by third generation ADPE.

5. SYSTEM SUPPLY IMPROVEMENTS. During February 1967, an IBM S/360-30F was installed at the Force Logistic Command (FLC), III MAF. In May 1967, the offset card system was converted to a new system employing centralized management by exception techniques. The records of all accounts in Vietnam were then maintained by the IBM S/360-30 within one set of direct access files. Other supply system improvements included mechanization of backorders, receipt control, locator, and document control files.

[1] Headquarters 3rd Force Service Regiment (FRS), Briefing to Joint Logistics Review Board, 18 September 1969.

[2] Headquarters U.S. Marine Corps, Memorandum, subject: Data Processing, Vietnam, 31 December 1969.

6. SYSTEM CAPACITY. During the first 6 months of operation under the new supply system on the IBM S/360-30, many improvements were made to increase processing efficiency. Program modifications were made to reduce processing time and environmental control was improved to reduce equipment maintenance time. Yet, by November 1967, the equipment was being utilized 700 hours per month including overhead and maintenance requirements. This left no time available for processing personnel accounting, which was still on the IBM 1401, and new systems scheduled for implementation such as the Manpower Management System (MMS) and the Supported Activities Supply System (SASSY). In effect, the system hardware was saturated performing supply processing, which was only 40 percent of the planned workload.

7. AUTOMATED SERVICE CENTER CONCEPT. A special task force was formed at HQMC to study the current and future requirements for WESTPAC ADPE, and during November and December 1967 a team visited the WESTPAC area to collect data concerning these requirements. While an upgrade of WESTPAC ADPE was being recommended, approved, and staffed, a new concept of the Automated Service Center was developed. Under this concept, large-scale computer installations would provide centralized data processing services for multiple organizations. The advantages of this concept were: that while all the serviced units would have large-scale data processing services available, resources could be pooled at one location reducing overall personnel and equipment costs.

8. EQUIPMENT EXPANSION. ADPE was again upgraded during April 1969 and under the Automated Service Center (ASC) concept, Da Nang was designated an ASC. An IBM S/360-50 was installed to perform processing for the functional areas of Supply, Fiscal, Personnel Accounting, and Maintenance Management. The programs previously processed on the IBM S/360-30 are currently being processed in a multiprogramming mode on the IBM S/360-50. As part of this upgrade, an ASC was established at Camp Butler, Okinawa. Camp Butler equipment included an IBM S/360-65, which could provide 100 percent backup service for RVN ASC customers. The advantage of having equipment capable of expansion without the necessity of reprogramming was evident during the upgrade just discussed. Although some programming was required to convert to new control programs, the upgrade was accomplished in 30 to 60 days with no loss of computer support during conversion.

9. Lessons Learned in Vietnam Relating to ADPS

a. Equipment

(1) Equipment employed during peacetime should be modular in design in order to effect an orderly expansion to accept a greater workload without reprogramming.

(2) Environmental control should be continually explored and perfected, taking advantage of the latest technical advances in power supplies, air conditioning, and portable housing.

(3) Maintenance personnel requirements should be planned and available upon deployment in either the form of military personnel or agreement with manufacturers.

(4) Basic spare parts sets should be identified and available upon deployment with an adequate pipeline established for the rapid procurement of additional parts as required.

b. Automated Data Processing Systems

(1) Systems employed should be modular in design in order to serve all echelons and various mixes of units.

(2) Systems should be able to accept additional volume and to automate manual tasks by having mechanized system components available if required.

(3) System expansion should not require the time-consuming tasks of redesign and reprogramming.

10. FUTURE PLANS AND ACTIONS

a. Equipment

(1) FMF ADPE upgrade is planned and budgeted to begin during FY 71. The automated service center concept is planned with the ultimate goal of three automated service centers per division/wing complex with teleprocessing capabilities to accept and display information between the ASC and remote terminals.

(2) Testing of improved ADPE housing is scheduled to begin during FY 70.

b. Automated Data Processing Systems

(1) Supply. A new supply system for FMF units, Supported Activities Supply System (SASSY) is under development. A prototype is being evaluated with plans to implement FMF-wide during FY 71-72.

(a) The planned system will serve all echelons of the FMF supply system from user through service units, and by selecting only system components required, will effectively serve any mix of units and/or commands' without redesign or reprogramming.

(b) In addition to providing FMF commanders with a flexible range of management tools, information will be available to the Marine Corps Integrated Information System (I^2S) for rapidly determining FMF-wide posture and requirements.

(c) The burden of record keeping and manual reporting will be reduced to transaction reporting and exception processing.

(d) Files maintained will be more comprehensive, accurate, up-to-date, and readily accessible.

(2) Financial Management

(a) All other systems will be closely related to the FMF financial accounting system. By consolidating and processing input generated by SASSY, maintenance, facilities, and administrative systems information will be available for planning, budgeting, reporting and reconciliation as required.

(b) Summary information from the FMF financial system will provide a significant portion of the input required to maintain the financial portion of the Marine Corps I^2S.

(3) Personnel Accounting

(a) The Manpower Management System (MMS) is planned for FMF-wide processing once ASCs are established. Under this system, FMF commanders will have available current and comprehensive information to satisfy local reporting and planning requirements.

(b) As data files are updated, transactions will be transmitted to the central processing point at Kansas City, Missouri, for inclusion in the Marine Corps Master Personnel Data Files (MCMPDF).

(4) Maintenance. A maintenance management system is under development which is planned to greatly improve the control and performance of all maintenance functions at the FMF level and maintain data files as part of the Marine Corps I^2S.

11. INITIAL STOCK CONTROL AND DISTRIBUTION SYSTEM. Prior to the implementation of the Marine Corps Unified Material Management System (MUMMS), the CONUS stock control and distribution system in use consisted of a bi-coastal distribution system with a supply center

performing inventory control functions for each coastal complex comprised of four stock accounts. Stock levels of materiel were maintained at stock accounts and supply centers. Stock and financial management functions were split among the stock accounts, supply centers, and two Inventory Control Points (ICPs), one at Headquarters Marine Corps (HQMC) and one at the Marine Corps Supply Activity (MCSA), Philadelphia, Pennsylvania. Automatic Data Processing Equipment (ADPE) utilized at that time was second generation IBM 1401 computers at the smaller activities and UNIVAC III computers at the Supply Centers and the MCSA, Philadelphia.

12. MARINE CORPS UNIFORM MATERIEL MANAGEMENT SYSTEM (MUMMS). MUMMS was implemented in 1967. It is an integrated system of centralized supply management that is designed to satisfy all internal and external Marine Corps requirements by utilizing modern management and automatic data processing techniques at a single Inventory Control Point and eight Remote Storage Activities (RSAs). It is a total system in that a unified effort is achieved by control and interface between sixteen subsystems utilizing various configurations of third generation computers to operate these subsystems. The subsystems fall into three general areas. Two areas, Supply/Financial and Technical, pertain to the functions of the RSAs. In the Supply/Financial area, the eight subsystems are concerned primarily with inventory control, accounting, procurement, budget, and supply management reports. The Technical area contains five subsystems to handle such functions as provisioning, technical data, war reserve, application, and data control. Of the three subsystems in the third area, Mechanization of Warehousing and Shipping Procedures, and Direct Supply Stock Control are used by all RSAs, while the Depot Maintenance Management subsystem is used only by the depot maintenance activity of the Marine Corps Supply Centers at Albany and Barstow. Requisitions are forwarded from specific units to the Inventory Control Point, Philadelphia, where they are processed, a materiel release order is forwarded to the RSA, and the subsystem, Mechanization of Warehousing and Shipping Procedures, schedules the issue of the materiel. When it is on its way to the requestor, a materiel release confirmation is sent to the Inventory Control Point and automatic billing effected.

13. ADDITIONAL MUMMS FEATURES. The ADP acquired to implement MUMMS allowed for the centralization of Marine Corps inventory management control function and ADP personnel at one major ICP. Increased secondary and selected item visibility has allowed for the selective exception type management required in an era of increasing backorders and decreasing stock fund dollar availability. The output of MUMMS serves all levels of management and operational output is utilized at the ICP and the various RSAs. Management data and reports are generated for use by managers at the RSAs, the ICP, Headquarters Marine Corps (HQMC), and higher headquarters such as the Department of the Navy and Department of Defense. Examples are the financial and budgetary reports utilized by HQMC as the basis for budget justification and requests, and the MILSTEP reports which are furnished to DOD. Computer compatibility with integrated materiel managers (Defense Supply Centers, General Service Administration, Army Tank and Automotive Command) has been achieved by the automated initiation of MILSTRIP requisitions and the processing of bills from these agencies. Through the media of MILSTRIP/MILSTRAP and other standard DOD programs, computer communication can be achieved with virtually all levels.[3]

14. MUMMS COMPATIBILITY CONSIDERATIONS. The system is fully compatible with all standardized requirements of the Department of Defense such as Military Standard Requisitioning and Issue Procedures (MILSTRIP), Military Standard Transaction Reporting and Accounting Procedure (MILSTRAP), Military Supply and Transportation Evaluation Procedure (MILSTEP), and Military Standard Transportation and Movement Procedure (MILSTAMP). MUMMS uses mechanization of warehousing and shipping procedures which are similar to and compatible with procedures of the Defense Supply Agency. The ADP applications were developed by the MUMMS Task Force after comprehensive evaluation of all requirements of an integrated logistic system. The centralized and integrated system, as developed, could only be accomplished through

[3] Headquarters, U.S. Marine Corps, Memorandum, subject: Automatic Data Processing, 15 January 1970.

utilization of the speed and capability of third generation computers in a multiprogramming environment. The complete range of ADP applications are discussed briefly in the MUMMS Introduction Manual, MCO P4400.70.[4]

15. OPERATIONAL EXPERIENCE DESIGNED INTO MUMMS. From the lessons learned in Vietnam and the problems encountered in CONUS, MUMMS was designed to:

a. Incorporate the requirements of Department of Defense/Department of Navy and the Marine Corps.

b. Centralize programming at one site to support the ICP and eight RSAs.

c. Take full advantage of the state of the art and technology in computer systems.

d. Resolve ADP problems existing under the former supply system.

e. Provide visibility for integrated and centralized total stores system assets.

f. Process requisitions, receipts, and adjustments against the master inventory record.

g. Provide centralized billing and receipts reconciliation.

h. Automate integrated general ledgers and financial reports.

i. Automate integrated input and output between the functions of procurement, allotment accounting, pricing, inventory control, and technical data.

j. Provide for warehouse workload planning and the production of daily management reports.

k. Automate the systems coordination and control of technical data, part, and end item application data.

l. Automate the computation and scheduling of provisioning support equipment.

m. Provide for computation of mobilization requirements and the withdrawal file.

n. Provide for visibility and control of selected items, down to separate battery/company level.

o. Provide for the DOD secondary item stratification, trial balance, segmentation coding, mobilization, budget backup, and the output of excess requirements.

p. Establish and automated management information system.

q. Provide for integration of the allotment records with the inventory control system.

r. Automate routine commitment/obligation of funds without manual approval or intervention.

[4] U.S. Marine Corps, Introduction Manual, MCO P4400.70, Marine Corps Unified Materiel Management System (MUMMS), 18 June 1966.

16. REFINEMENTS SINCE SYSTEM IMPLEMENTATION. System improvements effected during the period from May 1967 to the present include those listed below:

a. Computer upgrade during January 1968.

b. Conversion from data cell storage to disk storage for central essential files.

c. Adopted continuous system development, test, and implementation of additional routines included in basic MUMMS design but not initially implemented because of the phased MUMMS implementation plan. Examples are the interchangeability and substitutability routines and the Master Inventory File reconciliation with the Inventory Locator File.

d. Established reconciliation and requisition reject control and reporting programs.

e. Established Marine Corps Automatic Readiness Evaluation System/Force Status (MARES/FORSTAT) reporting and expediting system.

f. Implemented cyclic requisition processing schedule.

17. REACTION TO COMBAT SUPPORT REQUIREMENTS. The impact of the automated data processing system (ADPS) on logistic support for the Marine Corps combat forces in Vietram provided:

a. Centralized asset visibility, which allowed materiel to be furnished from the RSA stocking the materiel in response to any requirement.

b. The mechanized ability to issue reserved assets to fulfill high priority requisitions.

c. Ability to initiate immediate procurement of materiel for direct delivery to customers when no system assets are available.

18. LIMITATIONS. MUMMS has not fully met its intended purpose in the following areas:

a. Real-time requisition processing has not yet been achieved.

b. Remote access and inquiry at the ICP has not yet been achieved.

c. Optimum record accuracy has not been reached.

File purification procedures were included in the initial MUMMS design; however, unforeseen problems such as those with the data cell which repeatedly lost large amounts of data and a software package which was less efficient than anticipated, limited file purification and record cleanup action. Increased ADPE capability, use of disk storage in lieu of the data cell, and the implementation of the remaining file purification routines will considerably enhance this area.

19. SUMMARY. The lessons learned by the Marine Corps during the Vietnam era in the application of ADP technology to support logistics management are that:

a. Equipment employed during peacetime should be modular in design in order to effect an orderly expansion to accept a greater workload without reprogramming.

b. Environmental control should be continually explored and perfected, taking advantages of the latest technical advances in power supplies, air conditioning and portable housing.

c. Maintenance personnel requirements should be planned and available upon deployment either by use of military personnel or by agreement with manufacturers.

d. Basic spare parts sets should be identified and available upon deployment with an adequate pipeline established for the rapid procurement of additional parts as required.

e. Systems employed should be modular in design in order to serve all echelons and various mixes of units.

f. Systems should be able to accept additional volume and to automate manual tasks by having mechanized system components available if required.

g. System expansion should not require the time-consuming tasks of redesign and re-programming.

APPENDIX D
AIR FORCE AUTOMATED LOGISTICS SYSTEM

APPENDIX D

AIR FORCE AUTOMATED LOGISTICS SYSTEM

1. RESPONSIBILITY FOR OPERATIONS. The Air Force Chief of Staff exercises his authority and responsibility for operations through the Air Staff, which constitutes the top management and executive group in the Air Force, with direct supervision and control of operations.[1]

2. FUNCTIONAL AND AUTOMATION ASPECTS. The functional aspects of Automated Logistics Systems are exercised through the Deputy Chief of Staff, Systems and Logistics, and the automation aspects are exercised through the Deputy Chief of Staff, Comptroller. These two activities are closely coordinated. Through their mechanism and management tools, Headquarters USAF controls and monitors the design of automated data systems.[2]

3. SYSTEMS DESIGN AND DEVELOPMENT. Actual logistics systems design and development is divided between the Air Force Data Systems Design Center (AFDSDC) and the commands. Those systems which are determined to be standard across two or more commands, and which are not unique to the mission of any particular command, are normally assigned to the AFDSDC. Systems not standard within this meaning are normally assigned to the command concerned.[3]

4. AIR FORCE LOGISTICS COMMAND SYSTEMS RESPONSIBILITY. The Air Force Logistics Command (AFLC) is responsible to provide logistics support and services, and for automated systems related to this support.[4] The AFDSDC and the ALSC perform extensive and continuous coordination.

5. FOCUS ON ADVANCED LOGISTICS SYSTEMS CENTER. Since this monograph is focused primarily upon ADP support of logistics in its broad sense, the following discussion is necessarily tailored to the AFLC and its associated design center,[6]

6. ALSC MODERNIZATION PROGRAM. In 1954 the AFLC began an extensive program of modernizing its management information systems through utilization of automatic data processing equipment and through the development of an Air Force-wide data communications network which has evolved into the present-day DOD Automatic Digital Network (AUTODIN). Objectives to be achieved for the improved management of logistics were defined along functional lines with primary emphasis placed on wholesale logistics which were the responsibility of AFLC.

7. EARLY DEVELOPMENT PROBLEMS. System specifications were developed by AFLC Headquarters, and the detailed design and programming was accomplished by the Air Materiel Areas (AMAs) and depots. A single AMA or depot was assigned primary responsibility for the development of a particular system. When approved by Headquarters AFLC, the system was then implemented by other AMAs and depots. The AFLC Headquarters directed, monitored, and coordinated the development and implementation of the systems. This arrangement was difficult

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[1] Air University, Air Force Institute of Technology, School of Systems and Logistics, The Management of Air Force Supply, Third Edition, 1969, p. 1-67.
[2] U.S. Air Force Regulation 300-2, Data Automation and Policies, 1 April 1964.
[3] U.S. Air Force Regulation 23-36, Air Force Data Systems Design Center, 3 April 1968.
[4] U.S. Air Force Regulation 23-2, Air Force Logistics Command, 26 October 1967.
[5] U.S. Air Force Logistics Command Regulation 23-6, Organization and Mission-Field, AFLC Advanced Logistics Systems Center, 4 January 1968.
[6] Air Force Logistics Command Advanced Logistics Systems Center, Advanced Logistics System Master Plan, March 1968.

because of the geographical separation between the headquarters staff and the field activities. Data compatibility and systems integration were also difficult to achieve with system development work being accomplished at multiple locations. In addition, standard transaction formats and data standards, which were being levied on a DOD-wide basis, were difficult to design into the systems with development efforts decentralized. System development thus became costly, complicated, and difficult to manage.

8. CENTRALIZED SYSTEM DESIGN. The automation program was further complicated by having different types of computers throughout the command. This necessitated parallel development efforts for a number of the major processing systems. In addition to this being very costly in resource utilization and time, it created complicated interface problems. To correct these deficiencies, the responsibility for the development and programming of all AFLC data systems was returned to Headquarters AFLC in 1960. Improvements were realized in the development of standard systems and in achieving interface between systems. The concept of centralized system design has been further emphasized with the increased capability for integrated logistics systems provided by the 3rd generation computers now available. To this end, the Advanced Logistics Systems Center (ALSC) was activated 1 October 1967 at Wright-Patterson AFB.

9. CREATION OF AIR FORCE DATA SYSTEMS DESIGN CENTER (AFDSDC). In 1958 an Air Force standard base supply system group with representation from each of the major air commands was established to design a retail supply system to interface with the AFLC wholesale system. The development of standard base systems under the direction of Headquarters USAF evolved into the establishment of the Air Force Data Systems Design Center (AFDSDC) in October 1967.[7] The AFDSDC is responsible for the design, programming, and implementation of some 77 standard Air Force management systems of which the Air Force Standard Base Supply System is the largest.[8]

10. SCOPE OF AIR FORCE LOGISTICS COMMAND AUTOMATION. At the present time the AFLC processes nearly 400 command standard automated data systems on 120 computers located throughout the command.[9] Of the total number of systems, AFLC processes 179 automated systems on 11 IBM 7080 computers.[10] The Item Management Stock Control and Distribution System (IMSC&D) is the largest automated logistic system within the command and accounts for up to 30 percent of the total computer usage within the command.[11] This IBM 7080 system is representative of the logistic support capability and the system design approach of AFLC's existing logistic systems. Other major IBM 7080 systems are the systems for computing consumption item requirements, for managing depot level repair, and for worldwide asset control of recoverable items. In this monograph, specific system information will be given for the IMSC&D system with only brief descriptions of other major ADP applications.

11. SYSTEM COMPLEXITY AND INTERFACES. The complexity of the overall logistics system and the close interrelationship of the various logistic functions and processes are illustrated by the fact that over 60 percent of AFLC's current data systems directly interface (exchange data) with one or more other systems. Many systems have indirect interface with nearly all other systems. Figure D-1 illustrates the interface complexity of the IMSC&D system.[12]

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[7] U. S. Air Force Regulation 23-36, Organization and Mission-Field, Air Force Data Systems Design Center (AFDSDC), 3 April 1968.

[8] Brigadier General Vernon E. Turner, Presentation to the Joint Logistics Review Board, Functions of the Air Force Data Systems Design Center, 23 May 1969.

[9] Air Force Logistics Command Advanced Logistics Systems Center, Progress Report FY 70-1 for Quarter Ending September 1969, Part B, 23 October 1969.

[10] Air Force Logistics Command Recurring Publication 30-2, Data Automation Review, October 1969.

[11] Compiled from U. S. Air Force Report: 8-HAF-E6 (Section 1), EDPS Use by Application, October 1968-September 1969.

[12] Air Force Logistics Command, Advanced Logistics Systems Center, Advanced Logistics System Master Plan, Volume IV, p. 2, June 1969.

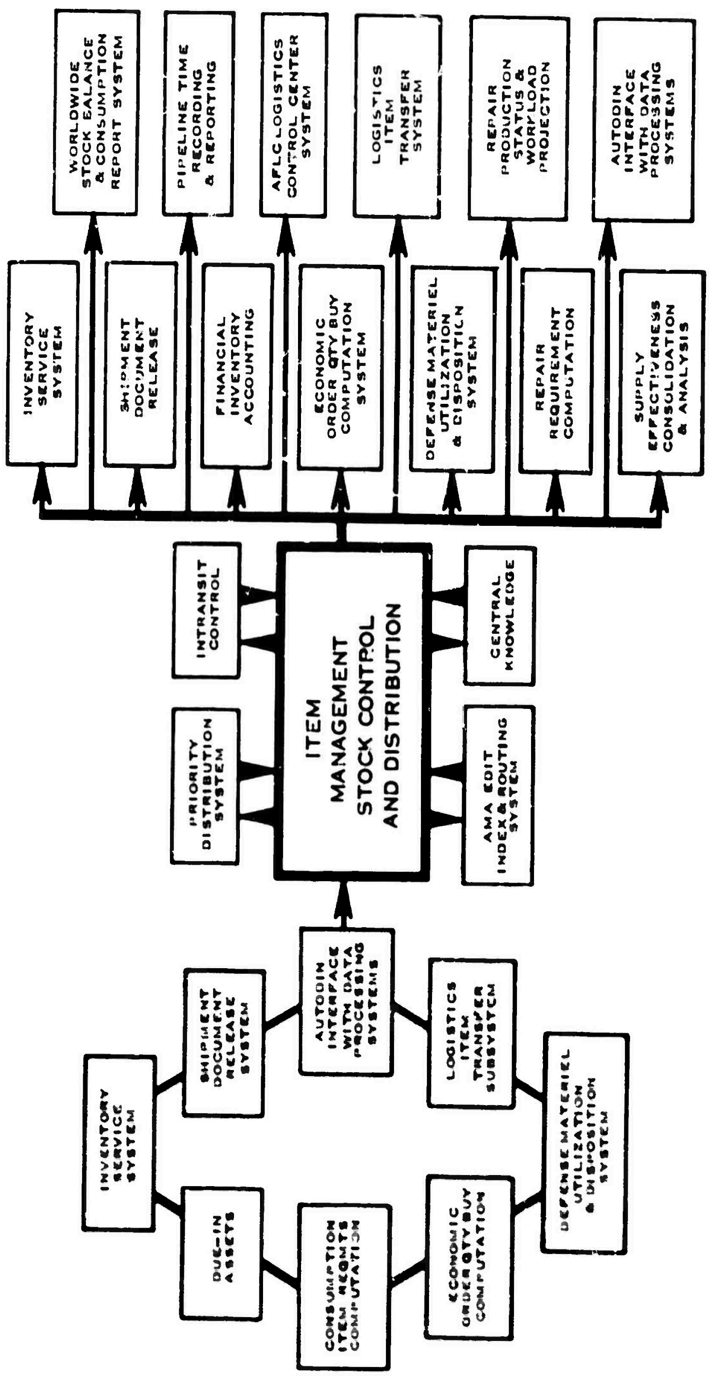

FIGURE D-1. INTERFACE COMPLEXITY OF PRESENT SYSTEMS

12. ITEM MANAGEMENT STOCK CONTROL AND DISTRIBUTION SYSTEM (IMSC&D). The IMSC&D system has been evolving since 1955 when the RAND Corporation undertook a project called Electrolog to determine the feasibility of stock control by computers. Other development efforts in AFLC gradually expended the concept to cover both stock control and distribution functions. In 1960, a standard IMSC&D system was implemented at several AFLC AMAs, using the IBM 705-II computer. When the IBM 7080 computers were obtained by AFLC in 1961, the 705-II programs were converted to IBM 7080 programs and the standard system was implemented at all AMAs. The system was redesigned in 1963 to implement the Military Standard Requisition and Issue Procedure (MILSTRIP) requirements and modified in 1966 and 1967 to accommodate the Military Standard Transaction Reporting and Accounting Procedure (MILSTRAP) and the Air Force Recoverable Assembly Management System (AFRAMS).[13]

13. IMSC&D FEATURES. The IMSC&D system supports the worldwide wholesale Inventory Control Point functions at each of AFLC's five AMAs. The purpose of the system is to provide an accounting and management mechanism for the receipt, control, and distribution of materiel by the AMAs. It processes requisitions and provides data for inventory control, requirements computations, depot production control, and interservice supply support. It provides positive response to worldwide customers--principally Air Force bases using the Standard Air Force Base Supply System--including other services, military assistance programs, and contractor demands. It accomplishes distribution and redistribution for both initial and follow-on support, and provides for selective management attention to such things as critical items, high value items, and classified items.

14. ADDITIONAL FEATURES. The IMSC&D system maintains accountable balances for assets in the AMA wholesale warehouses, and maintains memorandum balances for serviceable assets available for redistribution at specialized repair activities and other AFLC base support activities. Transaction reports of excess recoverable assemblies at Air Force bases are input daily into this system, which redistributes them against backorders or new requisitions. It processes data for over 902,000 items used by the Air Force. The five AMAs collectively process almost 5 1/2 million transactions per month. A total of 878 million characters of item data are stored on magnetic tapes for this system. The principal communication among the AMAs and the customers is by the AUTODIN System; however, large volume transmissions of periodic data between the AMAs are accomplished by mailing of IBM 7080 tapes.[14]

15. PRIORITY DISTRIBUTION SYSTEM (PDS). In 1963, the Priority Distribution System (PDS) was developed as a subsystem of the IMSC&D System to provide rapid and positive response to priority requisitions. Priority one through eight requisitions transmitted over AUTODIN are sent by punch card directly into the PDS for any of the 902,000 items covered by the IMSC&D System. Customers are advised of status within two hours. Approximately three million priority one through eight transactions are collectively processed by the five AMAs each month. Transaction data are output to the IMSC&D System by magnetic tape at the end of each daily cycle to update the IMSC&D files which in turn are used to update the PDS files each day. The PDS is operated at all AMAs on dual RCA 301 computers, configured with a random access device and a disk file storage capacity up to 80 million characters. The RCA 301s are tape-compatible with the IBM 7080s.[15]

16. RECOVERABLE CONSUMPTION ITEM REQUIREMENTS COMPUTATION SYSTEM. The Recoverable Consumption Item Requirements Computation System uses Air Force programs and past consumption data as a basis for computing item requirements and predicting future stock levels, fiscal year budget and buys programs, and time phased repair requirements. The system takes into account all on-hand and due-in assets. It also computes excesses, provides data

[13] U.S Air Force, Briefing to the Assistant Secretary of Defense (Installations and Logistics), Fort Ritchie, Maryland, Air Force Logistics Command, 13-14 September 1968

[14] Ibid

[15] Ibid

for contract termination considerations, identifies assets available for interservice use, and outputs inventory analysis summaries for management evaluation. Approximately 132,000 items are covered by this system which is processed on a quarterly schedule at all five AMAs. [16]

17. MANAGEMENT OF ITEMS SUBJECT TO REPAIR (MISTR) SYSTEM. Management of Items Subject to Repair (MISTR) is a system for managing the depot level repair of all recoverable items in the Air Force inventory. It covers items repaired by AFLC specialized repair activities and those repaired by commercial sources. Requirements data from the Recoverable Consumption Item Requirements Computation System are used as the basic source for determining the requirements factors. This interface insures complete correlation between the buy determining the requirements factors. This interface ensures complete correlation between the buy determination and the repair program as well as the basis for computing a long range forecast of repair needs for use in repair planning. Requirements data, worldwide asset data extracted from the transaction recording system within the AFRAMS program, and actual customer demands recorded in the IMSC&D System are correlated in a biweekly computation to determine the total worldwide stock level deficit. This deficit is then adjusted based on actual unserviceable items available for repair, resulting in a repair requirement by repair activity. Total requirements are then segmented by urgency of need to facilitate repair scheduling and application of available resources.

18. AIR FORCE RECOVERABLE ASSEMBLY MANAGEMENT SYSTEM (AFRAMS). The AFRAMS is a concept of management providing improved control for 163,000 Air Force managed items subject to depot level repair and is superimposed on many other logistic systems to produce an integrated management process. The concept was initially conceived to provide life-cycle management for recoverable assemblies by employing advanced techniques with respect to management control and data processing. The initial concept would have required a long-term development effort, including a future generation of data processing equipment and an advanced communications network. In the interest of the near-term benefit, a considerably reduced development effort was initiated and the resulting processes implemented 1 November 1967. The current system provides: a common item identification base for all Air Force used items, daily asset and levels knowledge for depot recoverable assemblies Air Force-wide, knowledge of depot recoverable assemblies Air Force-wide, and knowledge of recoverable assemblies in transit between Air Force activities. The concept of life cycle management of recoverable assemblies will be incorporated throughout all applicable processes of the Advanced Logistic System (ALS) which is currently being designed by AFLC's Advanced Logistics Systems Center.

19. ADVANCED LOGISTICS SYSTEM. The ALS is a closed-loop, cost effective, self-auditing method for managing the overall Air Force logistics system. It will forecast logistics support requirements in advance of actual needs and automatically provide selected items to the customer, provide a higher degree of product reliability, and respond effectively and efficiently in support of both normal and contingency operations. Many of the concepts which underlie the ALS are not new but their implementation is now feasible because of the advances made in the computer and management sciences together with the systems standardization already achieved within the Air Force. The acquisition of on-line, rapid data handling equipment will assist in the redesign of the current, functionally oriented systems into a single system more responsive to the needs of modern management.

20. ALS FEATURES. The ALS will have the capability to assimilate great masses of logistical data and provide current, meaningful management information. This will be accomplished through a unified data base wherein pertinent logistics information will be maintained by the use of advanced computers. The unified data base will provide a common source for users of the standard data elements. Standardization of the information will be accomplished by designating responsibilities for inputs and updates of specific data and by checks and balances within the management system. All operational and management decisions, regardless of functional identity, will be made from a current, common set of data.

[16] Ibid.

21. INCREASED RESPONSE. The response capability of the ALS will be designed to provide managers ready access to all available data in time to influence in-process logistics actions. With the on-line technique and remote stations capability, specific data can be input or displayed in a matter of seconds, minutes, or hours depending on the urgency of need. The selective recall of data will provide more timely and accurate decisions and will reduce the need for printouts of voluminous reports.

22. ALS CLOSED-LOOP SYSTEM. The capability to automatically update plans based on a constant feedback of appropriate information will be designed into the ALS (Figure D-2). The effectiveness of the planning cycle will be determined by measures of performance against stated objectives. This capability, in addition to providing a closed-loop management system, will also allow the evaluation through simulation of the proposed system and/or policy changes. Unrealistic planning can be detected and alternative actions selected to upgrade the operational performance of the system. The closed-loop principle of planning, implementing, controlling, and acquiring feedback will be inherent throughout the system. Both plans and policies will be pretested and alternatives developed through simulation before actual implementation.[17]

23. DIFFERENTIAL MANAGEMENT. The application of varying degrees of management emphasis and control over the use of logistics materiel and services will be accomplshed in the ALS. This capability known as differential management will utilize the responsiveness and flexibility inherent in the system. This permits the appropriate management activity to be accorded a logistics action, commensurate with item characteristics, mission, demand rates, asset availability, weapon system use, and similar cost effectiveness factors.

[17]Air Force Logistics Command Advanced Logistics Systems Center, Advanced Logistics Systems Master Plan, Volume IV, p. 8, June 1969.

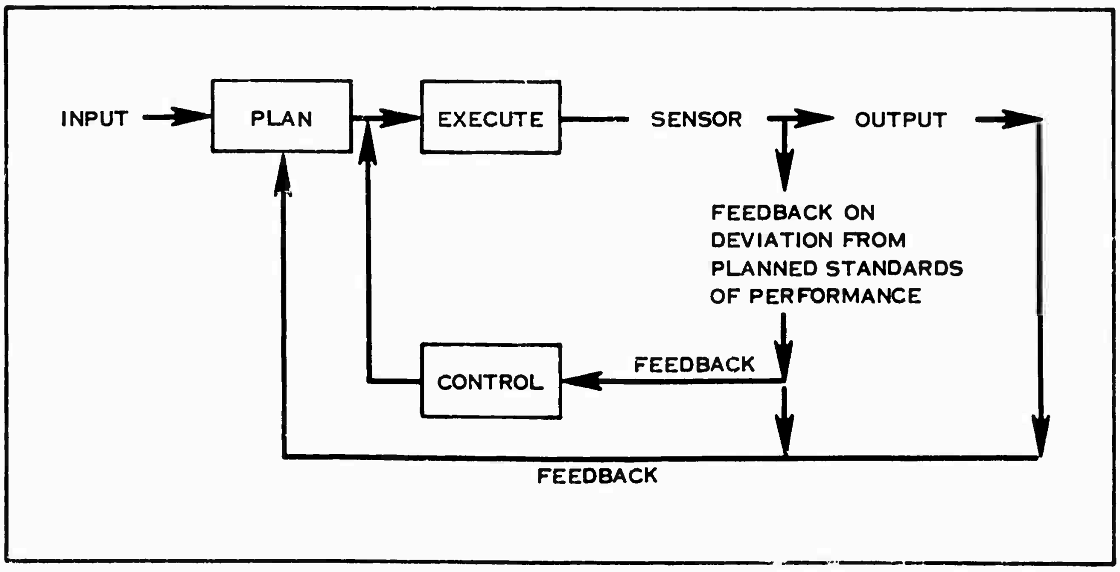

FIGURE D-2. ADVANCED LOGISTICS SYSTEM (AIR FORCE) CLOSED-LOOP SYSTEM

24. INTERRELATIONSHIP OF ALS FUNCTIONS. Seventeen logistics management functions or subsystems which comprise the ALS have been identified and are depicted in Figure D-3. These functions are all interrelated and are supported by many associated subsystems and processes. The ALS will be aggregated by processes that must be accomplished concurrently and sequentially to attain the desired common objectives.[18]

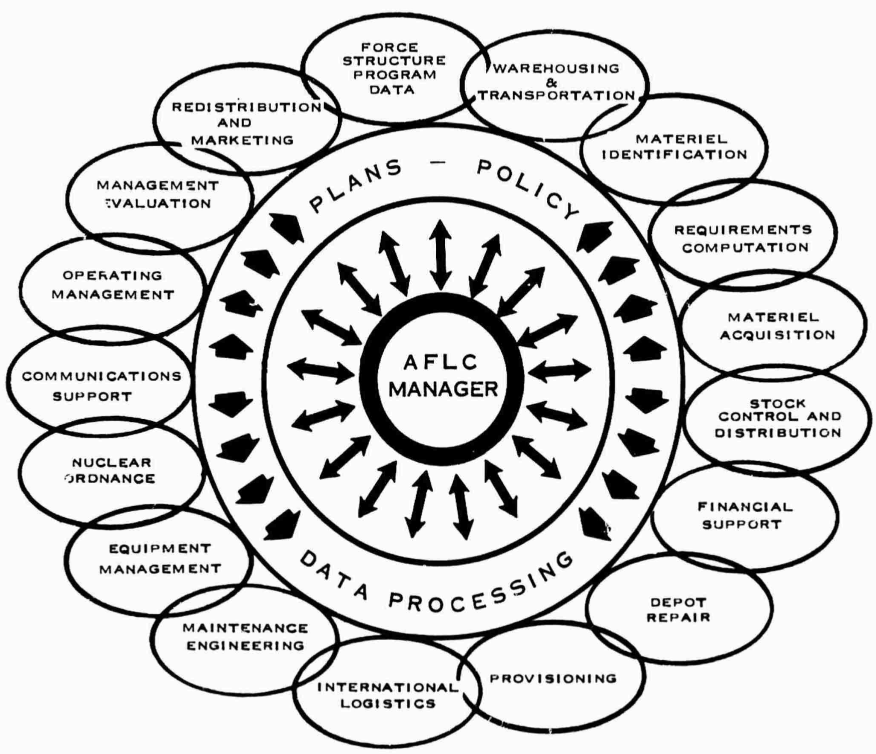

FIGURE D–3. FUNCTIONS OF THE ADVANCED LOGISTICS SYSTEM

The interactions of the various functional areas dictate that the related processes and subprocesses be integrated in a manner that will optimize total system effectiveness. The logistics functions of the ALS are accomplished through two principal methods of management. The first is product management. This method places the management of a weapon system, subsystem, commodity, or project under one weapon system (or commodity) manager. This manager is fully responsible for the total range of logistic functions and speaks with the full authority of the AFLC Commander. The second method of management is functional and includes management of functions such as warehousing, maintenance, transportation, and accounting. The product manager must be knowledgeable of the full spectrum of logistics affecting his weapon system or commodity, since the accomplishment of responsibilities cuts across many processes and functions. The ALS is designed to provide the product manager with data to permit the measurement of progress against a specific program, to coordinate the efforts of the functional managers as they relate to his system or commodity, and to identify problem areas. The functional manager is more vertically oriented, but his method of management also has horizontal aspects. For example, the maintenance manager must be aware of supply implications because of its effects on the maintenance activity. Likewise, the supply manager must be aware of the maintenance activities, of the procurement actions, and of the transportation capabilities.

[18] Ibid.

25. ALS BENEFITS. The benefits to be derived from the full implementation of the ALS are extensive and realistic. Major benefits are the:

a. Acquisition and maintenance of worldwide, timely, and accurate logistics data minimizing resupply times and optimizing the use of total assets.

b. Opportunity for improving the reliability of weapon systems and components through the use of responsive equipment performance monitoring procedures and the use of more precise statistical analysis techniques.

c. Improvement of buying and distribution decisions through availability of current item, contract, and contractor information and improved computational techniques.

d. Reduction in the data file maintenance through the elimination of the today's separate data system files and consolidation of the files into the ALS unified data bank which will permit all related processes to use the same data bank.

e. Increased accuracy of data through reduction of manual intervention in the processing of logistics data.

f. More effective utilization of on-hand assets through use of mathematical models that permit distribution of items to the bases or weapons with the greatest need.

g. Automatic preparation of equipment repair schedules responsive to the actual generation of reparable items.

h. Pretesting of new logistics policies and procedures, assessing impacts and determining cost trade-offs of system redesigns.

i. Evaluation of the impact of program changes and allocation of available resources.

j. System flexibility which permits fulfilling tactical unit mobility requirements under war/emergency conditions as well as peacetime operations.

k. Elimination of voluminous printouts and detailed reports through the use of visual displays and the timely provision of management data in the form and detail best suited to the needs of various levels of logistics management.

26. SUMMARY. The lessons learned by the Air Force in the application of ADP technology to support logistic management are that:

a. ADPS has been attaining an increasingly important role in the management of logistics functions since its introduction in the early 1950s.

b. Decentralization of ADP system design and programming made data compatibility and system standardization and integration difficult to achieve.

c. Use of nonstandard computer configurations complicated the development and implementation of multi-installation ADP programs.

d. Functional systems at different command levels must be developed in close coordination to achieve interface requirements.

e. The ability to handle masses of detailed data in a near real-time mode by advanced computer capability permits the development and implementation of logistics management concepts not here-to-fore feasible.

f. Planned advances in logistics management are predicted on the acquisition of more useful management information provided by multi-functional analyses of worldwide, timely, and accurate logistics data brought about by improved data transmission capability, use of unified data banks, and increased reliance on the capability provided by advanced ADPS technology.

APPENDIX E

DEFENSE SUPPLY AGENCY AUTOMATED LOGISTICS SYSTEM

APPENDIX E

DEFENSE SUPPLY AGENCY AUTOMATED LOGISTICS SYSTEM

1. CREATION OF THE DEFENSE SUPPLY AGENCY. The Defense Supply Agency (DSA) was created in 1962 by grouping under one Agency materiel single managers, together with a number of Depots which were under the management of the several Military Departments.

2. EARLY COMPATIBILITY PROBLEMS. The policies, procedures, data processing systems and hardware which DSA inherited from these diverse parents were something less than compatible, even where activity missions were similar. The Construction Supply Center had a mix of Honeywell and IBM 1401 and 1410 hardware and its procedures came from the Army Quartermaster and Engineers. The Industrial Supply Center brought RCA hardware and policies and procedures of the Navy which were specifically oriented to support Navy shipyards. The Electronics Center utilized IBM 7080 hardware and Air Force generated policies and procedures.

3. DIFFICULTIES GENERATED BY NONSTANDARD PROCEDURES. When the fact that each of the DSA centers were serving the same customers is considered, the problems of the situation become obvious. Each center presented a different and confusing face to the customers. With the differing policies, procedures and data processing systems, it was difficult for top management of DSA to know how each was performing its function and relatively impossible to ensure uniformity of performance. [1]

4. SHORT-RANGE IMPROVEMENTS. The DSA immediately started short-range improvements. Organizations and functions were consolidated; policies were standardized; procedures were standardized within the limitations imposed by the diverse kinds of hardware; thereby effecting, to the maximum practical extent, a uniform face to their customers.

5. PROBLEMS STEMMING FROM FORMER POLICIES There were problems beyond the reach of short range improvement. Data system development had been decentralized because of the differing ADP hardware and the consequent necessity for each center and depot to design and program its own ADP system. Further, in most centers the internal data processing systems were virtually constructed to service individual internal functions, and did not facilitate horizontal interface without major restructuring of files and processes.

6. OUTDATED EQUIPMENT. The ADP equipments were outdated sequential processing types, in contrast to newer random-assess hardware with mass data storage capacity. Data files used for functional processing were segmented and inconsistent among activities, and among functions within activities.

7. EXPANDING MISSION INCREASES PROBLEMS. These problems were compounded by the increasing range of items and functions being assigned to DSA, and by the Southeast Asia workload buildup. [2]

8. LONG-RANGE IMPROVEMENTS. The long-range DSA approach was to develop Uniform Automatic Data Processing Systems (UADPS) throughout the Agency to the degree practicable. The essential elements in UADPS are:

a. Applications common to two or more activities to be uniform.

[1] DSA briefing to Assistant Secretary of Defense (Installations and Logistics), Fort Ritchie, Md., DSA Program for Automating Logistics Systems, p. 3, 13-14 September 1968.

[2] Ibid., p. 4.

b. Achieve, to the degree practicable, uniform systems and hardware for all like activities.

c. All uniform systems to be designed and programmed centrally.

d. All changes and modifications to UADPS programs to be centrally controlled.

e. For all non-UADPS programs, i.e., programs unique to one activity, Headquarters approval is required, but they will be designed and programmed locally.

9. IMPROVEMENTS SUMMARY. In summary, the long range approach is to develop new and standardized systems, obtain new and more powerful hardware, and establish and maintain strict centralized control over all data systems development within DSA.

10. PROBLEM IDENTIFICATION. The effect that such a conglomerate of systems had upon logistics support during the Vietnam era is difficult to prove. The problems are easily identifiable. For example, the percentage of requisitions filled within allowable time frames dropped from 84.1 percent as of 1 January 1965 to 71.9 percent on 1 January 1967. The number of back orders on hand increased from 173,000 to 523,000 over the same period. Such performance must have had an impact on the Southeast Asia operations.[3]

11. CAUSATIVE FACTORS. It should be recognized, however, that many factors, other than a lack of a standard system, contributed to this deterioration of performance. Requisitions received for processing increased by one third, procurement line items awarded were up almost 30 percent, line items shipped were up almost 50 percent, items managed were up by 15 percent, and priority I and II requisitions increased by over 100 percent.

12. ADDITIONAL FACTORS. Another major element was lack of mobilization reserve stocks to meet the rapid buildup due to previous nonavailability of funds to procure such stocks. Further, the generally accepted national policy of both guns and butter made it difficult to obtain enough manufacturing capacity to take care of military requirements.

13. SIGNIFICANCE OF STANDARD ADPS. Marked improvement in performance would have been possible if standard automated logistics systems with adequate ADPE had existed. Accordingly, DSA has given high priority to the development and implementation of such standard systems.

14. DSA FOCAL POINT FOR SYSTEM CONTROL. The focal point for control of the DSA standard system is the Assistant Director, Plans, Programs and Systems, in DSA Headquarters. The functional Directorates, such as Supply Operations, Procurement and Production, and Contract Administration, participate importantly in the development of these standard systems through the formulation of requirements which set forth procedures, policies, and the end results desired.[4]

15. DATA SYSTEM AUTOMATION OFFICE (DSAO). The mission of designing, programming, testing, and maintaining the systems is assigned to the Data System Automation Office (DSAO) in Columbus, Ohio.[5]

a. To date DSAO has underway four major uniform systems:[6]

(1) MOWASP - Mechanization of Warehousing and Shipping Procedures. This has been implemented at the seven major depots under DSA.

[3]Defense Supply Agency, Summary Management Data Reports, 1 January 1965 to 1 January 1967.
[4]Defense Supply Agency, Headquarters Organization Manual 5100.1, January 1968.
[5]DSA Regulation, DSAR 5805.7, Responsibilities of Data Systems Automation Office, 5 March 1968.
[6]DSA Briefing to Assistant Secretary of Defense (Installations and Logistics), Fort Ritchie, Md., DSA Program for Automating Logistics Systems, p. 7, 13-14 September 1968.

(2) SAMMS - Standard Automated Materiel Management System. Implemented at one center on 1 October 1969, and scheduled for the four remaining centers at three-month intervals.

(3) MOCAS II - Mechanization of Contract Administration Services. Systems under development with initial implementation on 1 July 1970.

(4) APCAPS - Automated Payroll, Cost and Personnel System. DSAO has the skills and laboratory equipment to provide a test bench for the systems. Since all design and programming is accomplished in a single place an important contribution to systems commonality and interface is provided and also facilitates the use of scarce talent and avoidance of duplication of effort. However, despite the achievement of programming at a single office and the ability to cross utilize people and products, there has been little achievement of machine independence. The MOCAS IB system (the initial phase of MOCAS II), was programmed in IBM COBOL and converted to Honeywell equipment at about 85 percent efficiency.[7]

16. STANDARD AUTOMATED MATERIEL MANAGEMENT SYSTEM (SAMMS). SAMMS was selected as a representative DSA system for further discussion here.

a. SAMMS is a centrally developed system for installation at the Inventory Control Points of DSA. It satisfies the total functional mission requirements which include identification and management data relating to items managed, determination of items and quantities to be procured, the actual recording and control of all procurement actions, the accounting for and issuance of the materiel, and the financial accounting and billing for the issues.

17. SYSTEM DEVELOPMENT PROBLEMS. Experience proves that neither standard system nor equipment selection is simple to achieve. The first manufacturer did not meet the test standards and SAMMS proceeded after considerable delay. There was a need for continual scrubbing of the system specifications to ensure they reflected requirements for which a definite need existed.[8]

18. SIZE AND COST OF SAMMS. The equipment finally selected was the IBM S/360-50I. Core capacity is 512,000 characters. Input/output devices include disk, data cell, tape, card reader and punch, and printers. The annual rental cost of SAMMS equipment is projected at $7.1 million, a reduction of $1.6 million from current costs. The rental reduction is anticipated even though cost of laboratory equipment is included in the SAMMS figure. A total of 83 people are employed at the Defense System Automation Office in support of SAMMS at a cost of $1.1 million.[9]

19. SAMMS IMPLEMENTATION. The initial implementation of SAMMS was at the Defense Construction Supply Center on 1 October 1969, As of this date the evidence is strong that the system has and will continue to meet the purpose for which it was designed. Plans for installation of the system at other supply centers are going forward.

20. IMPLEMENTATION PROBLEMS. There were problems in connection with the initial implementation that need to be discussed. These problems stemmed mainly from lack of main frame time available from the IBM S/360-50I computer. This was caused by failure to anticipate the large increases in workload which occurred since original specifications were developed.[10]

a. The factors which led to failure to anticipate the increased workload were:

(1) The major buildup in Vietnam with the attendant materiel requirements.

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[7] Ibid., p. 8.

[8] Defense Supply Agency, Briefing to Secretary of Defense (Installations and Logistics), Fort Ritchie, Md., DSA Program for Automating SAMMS, pp. 1 and 2, 13-14 September 1968.

[9] Defense Supply Agency, Discussion with SAMMS Program Officer, 20 December 1969

[10] Ibid.

(2) The assignment of a half million additional items by the Services to DSA for management.

(3) The Services, due to funding austerity, placing demands on a retail, or as required basis, rather than larger quantities which would last for 3 to 6 months.

b. What is really required to meet the expanded time requirements are IBM S/360-65 main frames. However, DSA has no authority to make such a change without development of new specifications and requesting new competitive bids.

c. Existing authority for adding peripheral equipment was exercised which has alleviated the problem for now. However, added rental costs on these equipments make the total system more costly than the IBM S/360-65.

d. Another problem was the testing of the hypersensitive third generation hardware. Many software programs were to be furnished by the contractor. However, experience indicated that contractor personnel were no more expert or trained in this new equipment than DSA personnel, which led to assumption of software programs development by DSA personnel to meet the schedule.

e. SAMMS development was started under the provision that it would be done within currently available resources. To accomplish this, 100 programmer spaces were assessed against the five inventory control points, with job transfer rights. Under this procedure, 40 percent of the people gained were programmers while 60 percent were system analysts, and needed considerable additional training. Hindsight indicates that approximately 200 such personnel would have been a more realistic number to accomplish the job and to avoid the continual slippage that was experienced.

21. PROGRAMMING STANDARDS. It appears that programming standards should be developed for varying complexities of programs. These standards could be used to forecast the number of people required for system design within a given period.

22. SUMMARY. Several important lessons in ADP support to logistics have been learned by DSA during the Vietnam era.

a. Individual systems based on different policies, procedures, and equipment do not provide the desired degree of response to customer demands. The uniform application of standard systems compatible within the overall operation is required for improved mission support.

b. The design, development, and implementation of appropriate standard systems is a large and complex task which demands a focal point for direction at the agency headquarters level and a central design organization consistently staffed with a sufficient number of highly skilled personnel.

c. Experience gained through development of standard ADP systems of large scope is invaluable for design of subsequent systems. This can shorten the time and ease the work required for the process. It is illustrated by DSA experience with MOWASP and SAMMS, which is now applied to development of the remaining standard systems.

d. Each major ADP development should include an expansion factor to accommodate unpredictable changes in requirements which occur after the selection of ADP equipment. The DSA experience included several such mission expansions which reflected into ADP support systems in use and in development.

e. Advanced computer technology with its associated methods and techniques has provided the tool for greater effectiveness in logistics support by large organizations. However, optimum use of this tool is an evolutionary process based on knowledge and experience.

APPENDIX F

ADP COMPATIBILITY AND STANDARDIZATION

APPENDIX F

ADP COMPATIBILITY AND STANDARDIZATION

1. NEED FOR BASIC ADP MANAGEMENT TECHNIQUES. The unification of very large logistical systems and the achievement of elements of systems commonality among diverse systems is entirely dependent upon the establishment of basic ADP management techniques to provide a framework within which such unified processes can operate. Logistic ADPS are subject to changes in basic doctrine and functional systems requirements and therefore must achieve a degree of pliability obtainable only through the introduction of basic techniques. Logistics ADPS must, under changing requirements, have the ability to process the paperwork inherent within the systems operation; maintain a data base with a high degree of accuracy; and respond to management requirements with information required at any echelon. Effective management techniques must be incorporated in our ADPS design which will increase the responsiveness of ADP to the requirements of management and the customer.

2. STANDARD ADPE CONSIDERATIONS. Despite the many inherent problems involved in the installation of standard systems on completely compatible ADPE, there are many advantages involved in the use of the same family of equipment. Standard ADPE is defined as that capable of functioning on standard programs written in the same subset of higher level language. These are discussed under the headings listed below:

a. Standard Routines

(1) There are two categories of standard routines. The first are routines which are provided to a user by the manufacturer in his systems and program library. Some of these might be considered as programs rather than routines but the emphasis is on the word standard since these routines or programs may be used on any of the particular family of equipment. The control monitor, I/O (Input/Output), scientific compiler, business compiler, assembly system, sort, merge, report editor, library maintenance, executive scheduler, and software library routines number among the programs and routines in this category. Every manufacturer provides some of these in varying degrees of sophistication. Within a manufacturer's family of equipment, the model of computer or configuration of equipment may influence the availability of these routines since most are based upon some minimum size, amount of care, or configuration of equipment.

(2) The second category are routines which are written by users but within such a prescribed format that they may be incorporated into and called upon to operate within the program logic designed for that family of hardware. Open and closed subroutines fall within this category. Such routines are written to perform a certain function. They are simply segments of machine or logical coding constructed and documented in a prescribed manner so that they may be used by any programmer who wishes to perform the function on the subject hardware. One of the greatest problems in performing similar tasks on dissimilar equipment is that the task must be analyzed, coded, and tested for each piece of equipment. With the same equipment, a task need only be programmed once and thereafter made available to all other users.

(3) Only within the same family of hardware, can the problem of programming duplication be minimized and the first step is to establish a library of manufacturer supplied systems and subroutines together with subroutines produced by various users. The production of subroutines by users should be controlled and well documented and individual programming effort only permitted after a study of available routines has revealed the portion of

the job already coded and documented in subroutine form. If the same equipment permit standard programs, the ultimate in operating efficiency will have been achieved. However, if circumstances do not permit standard programs, efficiency to the degree permitted by the exchange or pooling of the logic through standard routines can still be achieved.

b. Programming Languages

(1) Higher level languages such as COBOL and FORTRAN do exist but the extent of their standardization is questionable. Considerable effort on an international level is being made by both manufacturers and users of computers to make these languages universal. Although differences in a language within a given manufacturer's equipment do exist they are relatively minor compared to the differences found in the same language between manufacturers. Without the same basic machine language and its compiler, it would be practically impossible to use different subsets of COBOL. With equipment of one manufacturer and of one family the same subset of COBOL and its compiler would be available.

(2) Identical subsets of the higher level language are necessary if standard subroutines are to be incorporated into each of the participating installation's libraries. The use of the same subset could also encourage the interchange of not only subroutines but entire programs. The major advantage would be that each programmer at any other installation could read, understand and alter any existing program depending upon the peculiar demands of his location and the degree of authority permitted. This would be very significant if basic standard programs are eventually developed. This would include even programs written in machine language. Without the same language subset, the standard routines such as control monitors, compilers, sorts and merges could not be obtained. The advantages in staffing and training to be mentioned in subsequent paragraphs would be impotent without this concept of identical subsets of languages.

c. Tapes and Formats. Tapes and formats would be standard due to the standard I/O routines and hardware allowing the interchange of data between all participating data processing installations. This would eliminate the major file conversion programming effort that has accompanied the transfer of functions between installations in the past. It should be noted that reference to standard tapes and formats does not mean standard record format. Rather, the reference is to the physical characteristics, coding structure and labels. In addition, I/O routines normally do the blocking and deblocking of tape records. The option would be available to prepare integrated reports at command headquarters rather than take each major subordinate command's summary and resummarize manually or try the enormous task of converting many formats to one.

d. Training

(1) The training of programmers, systems analysts, and operators would be standard and in the long run less expensive than peculiar training that would depend upon the individual hardware at each installation. The establishment of a training center to service all participating installations as well as others who might have similar equipment would be feasible and economically practical.

(2) Under this uniform training and subsequent apprenticeship program learning time could be shortened and valuable performance rating standards established. This program would substantially assist and alleviate the current critical staffing problem. It would aid all installations involved by providing them with properly trained personnel.

e. Staffing

(1) One of the most important factors in this category relates to the experience of the programmers and computer system analysts. Standard equipment, programming languages, and training concept would give each installation a pool of talent experienced and trained with the same hardware and software.

(2) Today, an installation experiencing a substantial increase in workload is hard-pressed to obtain experienced people either on a temporary or permanent basis. Under this standard equipment concept each programmer at any installation involved would have this required experience.

(a) Experience with the same hardware.

(b) Experience with the same language.

(c) Experience in similar applications.

(3) The experience in the same hardware and language would not only allow inter-installation promotions, transfers and TDY but would not hinder efficiency or increase the time span to complete a job. The similar application experience should mean less time for computer systems analysts as well as programmers to complete the problem definition and analysis of the particular task. It is worth noting that staffing flexibility would not only be in the programmer and computer systems analyst area but would be available in the operator and more importantly the supervisory positions.

(4) Staffing patterns at various data processing activities could be profitable compared in terms of workload. Personnel requirements could be more accurately determined by the elimination of the highly variable requirements presently determined in part by differences in hardware, language and applications.

f. Standard Operational Procedures

(1) Procedures such as tape library, console operation of program maintenance, scheduling including compiling and debugging, and organizational responsibility could be standardized. Several of these would not only be a natural result but a necessity. Through this device operating problems at any one installation would serve as experience to all other installations and could provoke the establishment of a preventive procedure to preclude the recurrence at another installation.

(2) In the area of scheduling procedures, the value of standard operational procedures can be easily defined. Installations could determine the impact an imposed system would have. Or in the case of a breakdown at a given installation the possibility of performing the work at other capable installations could be ascertained expediently if planned backup capability is not available.

(3) This high level of standardization in operational procedures that standard equipment would permit is necessary if we are to successfully use Utilization Reports or establish Standard Costing. The establishment of standard controls and management procedures would relieve the installation manager of many of the tedious routine tasks and free him for the more productive and creative tasks for which he is responsible.

g. Utilization Reporting

(1) Although utilization reporting is and will be a requirement regardless of whether standard equipment is available or not, its value as a measure of performance both qualitatively and quantitatively with the present conglomeration of hardware, routines, languages and procedures is extremely doubtful. Comparative analysis is impossible. Determining if a new imposed system can be absorbed is risky. With standard equipment and 40 to 75 percent of computer programming composed of standard library routines, we will be able not only to estimate the impact of an imposed system on our hardware resources but also on manpower resources.

(2) It is expected that performance levels once established would assist even those installations not participating in the standardization program. These indicators would

be a useful tool in establishing barometers of long range resource requirements. Standard equipment alone will not supply these measures, but the equipment coupled with standard routines, operational procedures, training, and programming will supply them.

(3) Utilization reporting would not be confined to the machines alone but programming effort and operator effort could be determined due to uniformity of training as well as equipment. The similarily of programming effort due to language and routines would make their effort measurable. Trouble spots could be spotted and additional aid given when and as required.

h. Standard Costing

(1) In the previous section it was mentioned that with accurate and standard utilization reporting it would be possible to determine the impact an imposed system would have. The price that must be paid to design and implement this system was not discussed. The word price rather than cost is used since price by definition is the cost of obtaining some benefit or advantage. While in the majority of computer systems the machine cost has been relatively accurately measured, very seldom is it possible to estimate the cost of the other factors and the effect the new system has on systems currently on the machine.

(2) Since standard equipment will permit standard routines and languages and allow the implementation of standardized training, utilization reporting, operational procedures (including scheduling), and to an extent staffing, standard costing can then be a reality. It is believed that:

(a) Many elements of a system will be identical with every system.

(b) There are those operations which are similar in nature but vary in time to perform them owing to either complexity or volume. These could now be closely estimated.

(c) Finally, there are those elements that are machine controlled. These can be calculated in advance. Up to this time they have been measurable but only on an installation basis.

(3) Therefore, it appears that standard costing could be implemented and the time, cost, man/machine requirement, and impact on the system could be more accurately evaluated. In addition, it would give management sufficient cost data that would either encourage the elimination of unnecessary reports or automation of an application based on the price.

i. Contractual Relationship. With the purchase or lease of standard equipment (one manufacturer, one family) the subsequent single contractual relationship would save time and expense. With one contract (or a set of like contracts) to cover all installations there would be standard definitions of chargeable and nonchargeable down time, prime shift and Service agreements. Presently, each manufacturer has different definitions. One may use 176 hours and another 200 hours as prime shift. One has free service 24 hours, another only prime shift free service.

j. Planning and Expansion

(1) With standardized equipment, operational procedures, utilization and costing, expansion from a predictive growth basis, as well as planning for the implementation of a system, can be more accurately evaluated and solved. Many installations operating on a like basis could enable the command to evaluate and recommend changes on a group basis rather than on an installation by installation basis. Currently, the impact of a system must be evaluated by each affected organization in detail, examined in detail by headquarters, rewritten into an integrated document and submitted to higher headquarters. This then requires the installation to request additional equipment on an independent basis. These

must be evaluated, each on its own merit. Separate specifications must be written and suppliers must submit a proposal on each one. This is not only a lengthy and cumbersome process but costly.

(2) The depth of knowledge that will ensue from dealing with standardized equipment, operational procedures, utilization reporting, standard costing as well as the cross-talk between installations should provide the experience necessary to more accurately predict the effect an increased workload will have on an installation's computing capability and human resources. This knowledge and uniformity will permit a more expeditious yet more thorough evaluation and subsequent solution to the problem.

k. Mission Transfer

(1) One of the most significant advantages of the standardized equipment approach is the ease with which a mission transfer could be carried out. Each of the preceding paragraphs gives an excellent reason why a mission transfer would be a relatively minor problem in data processing. Today, a mission transfer is not only a difficult and expensive task, but the time span required can render it ineffectual.

(2) One point of extreme importance that would enhance the mission transfer advantage is the mobilization planning aspect. Not only would the installation have the built-in capability that is normally allowed but the backup available from each participant. Any emergency plan could be executed to an extent at any installation with only a minor effect.

l. Equipment Costs. It is possible that equipment costs, whether bought or leased, would be higher, since to take full advantage of the factors presented in the foregoing paragraphs some of the smaller installations might receive more sophisticated and larger equipment than their workload would dictate. However, it is reasonable to assume that some of this excess cost would be offset by the price break offered by most manufacturers in a large bulk purchase.

3. PRICE CONSIDERATIONS. With the exception of those applications for ADPE which justify the issuance of waivers by DOD, the normal acquisitions of ADPE are through the competitive processes established within each Service. The establishment of the requirement for competitive bidding inherently tends to allow all manufacturers to compete for government ADPE acquisitions. The consideration of price for ADPE is a major factor in the selection process providing that all requirements of the specifications are otherwise met. Normally, each installation or group of like installations prepare separate specifications which become subject to separate bidding and selection procedures. All of these factors and others, form a constraint on the probability of securing standard ADPE outside of a limited range of installations. While all of the benefits of standardized equipment are available to limited groups of installations, it is estimated that approximately 50 percent of all programming is of the type common to most or all of the installations within a Service. These normally include facility management, personnel, administration, financial, manpower, payroll, budget, and installation management. The consideration of devices, techniques, software and/or programs which will contribute to a higher degree of machine independence within our present environment must become a matter of major importance and discussion.

4. MANAGEMENT INFORMATION SYSTEMS. Logistic systems in existence today have achieved a high degree of automation in all Services. With a wide variety of equipments, languages and system designs, it is only natural that each of the Services are looking forward to programs which will standardize operations to the highest degree possible. Management Information Systems is an overall term with many inherent parts and many interpretations. The Bureau of the Budget defines the word "Systems" as "an assembly of procedures, proceses, methods, routines or techniques united by some form of regulated interaction to form an organized whole." Management Information Systems can best be defined as "the results of the implementation of related policies and procedures, which, utilizing electronic processing devices, produce data necessary to coordinate, control, and/or make decisions applicable to

the functions processed." This definition infers a prior or related process which also requires separate definition. Examination of the problem may be made in the following terms:

a. The word "systems" requires a modifying word attached to it to indicate either the type system meant or the level at which the system works. As an illustration, a requisition processing system is part of the total of stock control functional systems and is essentially one of many operating systems. It is from these operating systems that we derive the majority of our management information and the systems handling the varied types of management information.

b. The following descriptions provide further clarification.

(1) Operating Systems are those computer, punch card or manual, processes or procedures which execute the handling of paper work on the logistics factory floor, i. e., requisition, receipts, adjustment, bills, contracts, orders, supply control studies, and all other paper processing necessary to the fulfillment of the logistic functions. Future systems should be designed to standarize these type of processes to the maximum extent possible as each function is implemented.

(2) Management Information Systems are comprised of four types categorized as follows:

(a) Controlled Reports. Controlled Reports emanate entirely from either the operation or the data base used in the operating systems. Generally, they are controlled by RCS (Reports Control Symbols) issued at the level of management requiring the information. Approximately 40 percent of all management information is generated in this classification. Future systems should standardize this area as each function is implemented.

(b) Operating Statistics. Operating statistics are generated automatically on a planned basis from the operating system transactions or data base and supply various levels of management with the statistics necessary to control the operation or evaluate the effectiveness of the function. Future systems should standardize this area in each function where the operating system is standardized and at the same time on a progressive basis. Approximately 10 percent of all management information is in this form.

(c) Uncontrolled Listings, Reports and Answers to Inquiries. Approximately 10 percent of all management information is generated in this form from the operating data base or transactions. Normally this type of information is the result of one-time requests and received by management to facilitate specific decisions or evaluations. Future systems should fulfill the requirements of this area through the new technology of Report Generator Processes instead of normal programming techniques after the data base and operating systems are established.

(d) Display, Evaluation, Summary, Analysis, Models. Normally associated with Command and Control requirements, these techniques should be available to management after the operating system is standardized, the data base is purified and stabilized, and all other facets of the management information area are available through standard design. Approximately 40 percent of the total area of management information is of this type and is available to management based upon proper analysis of its requirements, and the communication of such requirements to the designers of future systems.

5. TECHNIQUES TO ACHIEVE MACHINE INDEPENDENCE. Considering the constraints affecting the selection of equipment to achieve standardization, it is necessary then to consider the techniques which are available, the application of which will enhance the ability to achieve varying degrees of machine independence. These may be categorized as Standard Languages, MACRO Language, File Organization, and Translation/Emulation/Simulation.

a. Standard Language. For example, COBOL can achieve maximum effectiveness in machine independence only if the version of COBOL used can be compiled and assembled with the same identical, compatible compiler. COBOL-61 is considered to be the original version of COBOL. COBOL-61 Extended, enlarged the usage of COBOL but both versions were subject to the adaption by different equipment manufacturers to various, different compilers which best suited the peculiar characteristics of their equipment circuitry and their independent machine language. The publication of COBOL-65 was in the form of a dictionary which formed the parameters within which the American Standards Association approved a subset. The principal characteristic of COBOL-65, among many, was the extension of language to random processing. The basic COBOL-65, however, included various forms of representation, any one of which could be included in a subset compatible only to the compiler which recognized that peculiar use of form. Each manufacturer formed separate subsets best suited to his needs. The ability to translate was enhanced because of the use of a common base but is constrained by differences in form usage (minor) and in instruction inclusions (major). In the continuing discussion it will be assumed that both functional and ADP logic have been defined in general terms but that detailed logic and coding constitute the remaining work in the Procedure Division. COBOL programs are written in four divisions defined as follows:

(1) Procedure Division. This division contains the instructions covering the functional process basic to the requirement of the program. The work involved is assumed to include the preparation of the detailed block diagrams covering the logic of the process and the coding necessary to instruct the machine to perform the necessary logical process. It is also assumed that the version of the COBOL language used will be that which is compatible to the compiler furnished with the equipment used. The procedure division may refer to data by calling upon the Data Management Routine (DMR) for the files defined in the standard Data Division.

(2) Data Division. The Data Division defines and describes all data and files used in the program. This may be in several forms. The basic method defines and describes all files and establishes a coding technique for reference purposes in the Procedures Division. The preferred method assumes the existence of a standard file structure and its associated DMR which will provide interface to the Procedure Division and standard definitions to be inserted automatically into the Data Division. Either method assumes the existence of defined input and output files. The basic method assumes that the master file must be created for the purpose of the program.

(3) Environment Division. This division defines and describes the equipment available for the processing of the program.

(4) Identification Division. This division identifies and describes the organization and personnel involved with the operation of the program.

(5) Work Requirements. For the purpose of this discussion it is assumed that the four divisions of a COBOL Program require the following degrees of work:

Procedure Division	60%
Data Division	33%
Environment Division	5%
Identification Division	2%
Total	100%

(6) Basic Factors. The work breakdown structure associated with the design and programming of the COBOL Program is predicated upon the following basic factors:

(a) The Procedure Division is written in a published and accepted version subset of COBOL-65. It utilizes labels or tags to address data in a standard file organization. It addresses the process of the functional requirement in terms of design of detailed ADP logic and detailed coding.

(b) The Data Division consists of file definitions written by the Programmer or inserted automatically from a standard library of definitions as contained in the DMR, written in Basic Assembly Language (BAL) or in basic machine language.

(c) The Environment Division and the Identification Division are as described above.

b. MACRO Language. Systems by their very nature are viable and will remain in a state of evolution indefinitely. The reprogramming burden, to keep pace with changing requirements and the extensive programming effort required demands the application of a higher order programming technique than now employed. The application of the MACRO technique in programming will relieve the application programmer of many detailed steps formerly required. In addition, it will enhance the ability to exercise control of the standard operating systems. The MACRO structure consists of Executive Control Routines (ECRs), Data Management Routines (DMRs), and MACRO Instructions (MACROs).

(1) Executive Control Routines (ECRs), Data Management Routines (DMRs), and MACRO Instructions (MACROs). ECRs, DMRs, and MACROs are types of software required for internal ADPE operating efficiency, reduction of application programmer effort and elimination of duplicate effort. Normally, these are developed internally and not supplied by the ADPE vendor. Routines of this type facilitate file manipulation, allocate memory resources, provide common and redundant use facilities, and control the efficiency of internal operating requirements.

(a) Executive Control Routines (ECRs). The Executive Control Routine (ECR) provides extensions to the standard vendor supplied operating control system. The purpose of such extensions is to provide specialized job accounting and control routines that are desirable in a standardized system. For example, an ECR could be used to record and display or print the number of entires or requests for Immediate Access Storage (IAS) files. Such data are used to analyze the effectiveness of file organization and system integration.

(b) Data Management Routines (DMRs). The Data Management Control Routine (DMR) provides the application programmer with a consistent standardized method for data acquisition. The DMR analyzes the application programmer's request to determine the data element or elements which he requires for further processing. The requirement may be the same for all data requests in a program or it may vary significantly from one data request to the next. The standardized DMR places the requested data element(s) in predefined memory areas located with the application program. The programmer may process the data using symbolic names (labels) to define the data elements. The DMR retains control of the remaining data elements for which the application programmer has no need. The DMR is an extension to the normal vendor supplied input and output routines. It simplifies the application programmer's data handling logic and provides for additional security of the unused data elements from each Master Data Record. It is specifically oriented to the standardized Master File Organization. This specific design of the DMR enables more efficient handling of large variable length records. The DMR will access the correct data record from IAS, deblock it into logical records, and place the specific segments in memory for the programmer as required. The standard Master Data Record will have an associated DMR to interface with the applications programs.

(c) MACRO Instructions (MACROs). A MACRO instruction is one instruction in the source program which is used to specify a whole routine consisting of many actual object programs or machine instructions which are required repetitively.

c. File Organization. Duplication of information cannot always be avoided, but the level of duplication must be minimized. Data maintenance for control data elements and key information in files is duplicated extensively in multifile systems. It is a virtual impossibility to keep these data in the files in consonance because of the variations and frequencies in processing the files, and the ever-increasing requirement for machine time in already overburdened systems. Each file in a multifile system is normally assembled by the data

processing operation from files of various functional areas for the specific purpose of one manager. As a result the data in the file are not validated by the various other managers. The Master File Organization (MFO) concept, applied to any master file requirement, necessitates the alignment of data elements associated with key data elements into homogeneous sectors for the purpose of integrating the systems and the ADPE operations within frequency limitations. Redundancy of data elements within files is eliminated enabling currency in the maintenance of file changes. The publication of file format provides the systems and operational managers with a menu of the content of the data base which indicates the data used for automated, semi-automated, or manual decision processes (requisition filling, ordering and posting). The MFO concept also specifically assigns responsibility for ownership and maintenance of designated data elements rather than the ownership of multiple/single files with the responsibility for maintenance divided among several managers.

d. Translation. For the purpose of this discussion, translation is defined as a computerized translation of a program written in a language compatible to a specific compiler to change automatically or indicate to a programmer the areas to be changed to adapt the program to a different specific compiler. Computer translation accomplishes three different forms of program change indicators.

(1) The more efficient the translation program or the greater degree of compatibility between languages, the larger amount of automatic translation will occur. These are the instructions in both language versions which match identically, both in mode of representation and in instruction usage.

(2) The instructions in the original language which are not in the same mode of representation as required by the compiler to which the program is being translated, are indicated for manual change by the programmer. Automatic conversion of modes of representation require extensive table look-up facilities and computer capability which are normally not available.

(3) Instructions in the original language program which are not included in the instruction subset of the new compiler are indicated in the translation printout and require extensive and major effort on the part of the programmer to achieve the same resulting process through use of the language available in the subset of the new compiler.

e. Emulation. The programs from one computer are permitted to process on another computer at the same or higher speeds with no reprogramming. This is accomplished through a physical alteration to the new computer in that it may accept input and produce output as though it were the original computer.[1]

f. Simulation. One computer is enabled to execute a program written for a different computer. This is accomplished through the use of a computer program which forces the new computer to function like or imitate the original computer at reduced speeds with no reprogramming.

6. RELATIONSHIPS AND VALUES OF MACHINE INDEPENDENCE. Based upon the availability/nonavailability of Standard Language (COBOL), MACRO Languages, File Structure, and Translation capability, the following relationships and values of machine independence can be derived:

[1] Henry A. Lichstein, "When Should You Emulate?", Datamation Magazine, November 1969, p. 205.

a. Usage at another installation with identical equipment, compiler, file structure, file content, and DMR will result in the requirement for the following work:

Procedure Division	0%	(0% of 60%)
Data Division	0%	(0% of 33%)
Environment Division	0%	(0% of 5%)
Identification Division	2%	(100 of 2%)
Total	2%	

(Machine independence = 98%)

b. Usage at another installation with identical equipment, compiler, file structure and associated DMR but with a changed file content, will result in the requirement for the following work:

Procedure Division	0%	(0% of 60%)
Data Division	5%	(15% of 33%)
Environment Division	1%	(20% of 5%)
Identification Division	2%	(100% of 2)
Total	8%	

(Machine Independence = 92%)

c. Usage at another installation with different equipment, compiler and COBOL language but with identical file structure and translation facility, will result in the requirement for the following work:

Translation to new compiler	15%	(25% of 60%)
Recode DMR only	10%	(30% of 33%)
Environment Division	5%	(100% of 5%)
Identification Division	2%	(100% of 2%)
Total	32%	

(Machine Independence = 68%)

d. Usage at another installation with different equipment, compiler, COBOL language and file structure but with translation facility, will result in the requirement for the following work:

Translation to new compiler	15%	(25% of 60%)
Data Division	33%	(100% of 33%)
Environment Division	5%	(100% of 5%)
Identification Division	2%	(100% of 2%)
Total	55%	

(Machine Independence = 45%)

e. Usage at another installation, with different equipment, compiler, COBOL language and no translation facility but with standard file structure and its associated DMR logic, will result in the requirement for the following work:

Recode to new compiler	45%	(75% of 60%)
Recode DMR only	10%	(30% of 33%)
Environment Division	5%	(100% of 5%)
Identification Division	2%	(100% of 2%)
Total	62%	

(Machine Independence = 38%)

f. Usage at another installation with different equipment, compiler, COBOL language and with no translation facility or standard file structure, will result in the requirement for the following work:

Recode to new compiler	45%	(75% of 60%)
Data Division	33%	(100% of 33%)
Environment Division	5%	(100% of 5%)
Identification Division	2%	(100% of 2%)
Total	85%	

(Machine Independence = 15%)

7. SAVINGS COMPUTATION. In a multi-installation standard system development, it is not unreasonable to assume the availability of 100 COBOL programs. At an assumed hourly rate of $7 it can readily be determined that one year of effort would amount to 2080 hours X 100 programmers X $7 per hour or $1,456,000. Use of standard programs under the conditions listed and related to the degree of machine independence will save the following amounts:

Machine Independence	Dollars Saved Yearly Based on 100 COBOL Programmers
98%	1,426,880
92%	1,339,520
68%	990,080
45%	655,200
38%	553,280
15%	218,400

8. PERCENTAGE OF MACHINE INDEPENDENCE. Related to the techniques discussed, the percentage of machine independence can be related as follows:

Technique	Percentage	Dollar Value
COBOL Program Logic Only	15	218,400
File Structure and DMR	23	334,880
Translation Capability	30	436,800
Total	68	990,080

9. INCREASING ADP RESPONSIVENESS. In addition to the effort necessary to achieve the maximum degree of machine independence, effective management techniques must be incorporated into our approach to ADP which will increase the responsiveness of ADP to the requirements of both management and the customer. The ADP management techniques listed below are examples of elements necessary.

a. Extension and acceleration of the various DOD and Service/DSA data element and code standardization programs. This will assist in controlling the proliferation of data elements and code while the data base is being standardized. The programs are designed to:

(1) Facilitate interchange and compatibility of data among defense information and data systems and those of other government and nongovernment agencies.

(2) Avoid costly and time-consuming development of elements and codes by activities when they are available elsewhere.

(3) Reduce the number of data elements and codes by eliminating those which are duplicative except for minor variations.

(4) Reduce the data processing costs by using standard codes in lieu of the full description of the data items.

(5) Facilitate development of standard information and data systems by standardizing the data elements and codes which serve as building blocks for systems.

b. The design and use of standard computer processing codes, together with cross reference tables to external code usage, to limit the impact of code changes on standard computer programs.

c. The publication of standard ADP logistic terminology, other than standard data elements and codes, in a DOD-wide logistic ADP Glossary to eliminate variations in descriptions of systems and processes between levels and programs.

d. The establishment of a classification technique is essential to avoid the major cause for past proliferation and duplication of effort in the design and development of systems. The significance of developing a logical method to classify and identify the systems used to support mission must be recognized. The integration of systems is a major objective and it is essential that the classification technique established provide for identification of not only the responsible manager who directs and controls the systems requirements but also those managers who utilize the data from other sources in the performance of their assigned mission. Systems which are not classified cannot be identified and their content cannot be measured or cataloged for effective management control or use.

e. Modular programming techniques associated with third generation operating systems software enable the construction of COBOL source programs with modules applicable to varying requirements and installations on a machine independent basis. It also permits the change of single or multiple modules within large programs to accommodate the changing requirements of the functional managers.

f. The following ADP management techniques are necessary for standard documentation.

(1) Automatic Flow Charting Techniques. Two types of automatic flow charting techniques are:

(a) ADP block diagrams to reduce the time spent by programmers in finalizing the work done in creating source programs. The employment of flow chart language also assists the programmers in preliminary outlines and layouts necessary to detailed programming and module definition.

(b) The application of the automatic flow chart technique to the definition and charting of functional requirements to enable easy comprehension and approval by the functional managers.

(2) Indexing With Dedicated Number Designations. A technique of indexing all standard computer programs through the publication of regulations with dedicated number designations which indicate level, program function, language, and type of computer for the purpose of indexing standard systems and programs.

10. LIBRARY OF STANDARD SYSTEMS AND PROGRAMS. In addition, the Services/DSA should expand their documentation of existing systems to utilize the publication of standard programs to form a library of standard systems and programs. The potential computerization of an established library will, in relation to standard systems and program development:

a. Control new systems requirements.

b. Control duplicate development of like functions.

c. Employ modeling techniques for:

(1) Matching existing systems.

(2) Evaluating new system requirements and/or changes.

(3) Preliminary application systems design, including consideration of alternative designs and related costs.

(4) Parametric simulations in areas of functional systems design to evaluate variations in criteria or guidance whose values vary with the circumstances of their application.

(5) System optimization.

11. COMPUTERIZED MODELING TECHNIQUES. Computerized Modeling Techniques will enable the automation of systems control in four major areas:

a. Applications

(1) Refined system design, including the analysis of response in real time systems and the scheduling of multiprogrammed operations.

(2) Preliminary design of common applications packages, memory required, required speed of execution, compatibility considerations for both hardware and languages.

(3) Impact of expected workload changes, in terms of required computer capacity and programming resources.

b. ADP Hardware

(1) Equipment selection; evaluating equipment based on specific components and optional features, including emulation, and specific workload characteristics. Includes the Central Processing Unit, storage, communications processors, lines and remote terminals.

(2) Equipment assessment; evaluate alternative approaches for increasing the capacity of an installation.

(3) Evaluation of the effect of new equipment changes and announcements—their costs and benefits for a specific organization.

(4) Centralized coordination and control of computer acquisition in a multi-installation environment where frequent demands arise for equipment acquisition and updating.

c. Software

(1) Software selection; evaluate alternative programming languages, operating systems, etc., with respect to specific workload.

(2) Preliminary design of new software systems—functions to be performed, memory limitations, necessary speed of execution.

(3) Program planning; develop expected program sizes, internal memory allocations, execution times, which can be used as the preliminary plans for each program.

(4) Conversion planning; evaluate alternative approaches such as emulation versus translation versus recoding versus redesign and reprogramming. Compute cost, running time and programming resources needed for each.

(5) Evaluation of existing programs to determine which ones should be rewritten, define each program, check for major discrepancies between actual performance and predicted performance.

d. Management

(1) Workload scheduling; projections for developing computer schedules, multiprogramming job schedules, polling remote terminals in a data communications network, and programmer manpower loading.

(2) Purchase versus rental analysis, for the procurement of new equipment.

(3) Evaluation of alternative data processing plans—costs, response times, etc., of centralized versus decentralized installations, based on current and projected workloads.

APPENDIX G
LIST OF ACRONYMS AND ABBREVIATIONS

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ADP	Automatic Data Processing
ADPE	Automatic Data Processing Equipment
ADPS	Automatic Data Processing Systems
AESRS	Army Equipment Status Reporting System
AFDSDC	Air Force Data Systems Design Center
AFLC	Air Force Logistics Command
AFRAMS	Air Force Recoverable Assembly Management System
ALPHA	AMC Logistics Program Hardcore Automated
ALS	Advanced Logistics System
ALSC	Advanced Logistics Systems Center
AMA	Air Materiel Area
AMC	Army Materiel Command
AMCCDO	AMC Catalog Data Office
AMDF	Army Master Data File
APCAPS	Automated Payroll Cost and Personnel System
APG	Aberdeen Proving Ground
AR	Army Regulation
ASC	Automated Service Center
ASO	Aviation Supply Office
AUTODIN	Automatic Digital Network
BAL	Basic Assembly Language
BLSG	Brigade Logistics Support Group
CASSA	CONARC Automated Systems Support Agency
COBOL	Common Business Oriented Language
COCOAS	CONARC Class I Automated System

CONEDS	U.S. Continental Army Command Schools
CONUS	Continental United States
COSMOS	Centralization of Supply Management Operation System
CPU	Central Processing Unit
CS_3	Combat Service Support System
CY	Calendar Year
DA	Department of the Army
DAAS	Defense Automatic Addressing System
DED	Data Element Dictionary
DEPREP	JCS Deployment Reporting System
DIDS	DLSC Integrated Data System
DLSC	Defense Logistics Services Center
DLOGS	Division Logistics System
DMCC	Depot Maintenance Control Center
DMR	Data Management Routine
DOD	Department of Defense
DSA	Defense Supply Agency
DSAO	Data Systems Automation Office
DSU	Direct Support Unit
EAM	Electronic Accounting Machine
ECR	Executive Control Routine
EDP	Electronic Data Processing
EDPM	Electronic Data Processing Machine
EDPS	Electronic Data Processing System
EDPS	Equipment Distribution Planning Studies
ESO	Electronics Supply Office
FIIN	Federal Item Identification Number
FLC	Fleet Logistic Command
FMF	Fleet Marine Force
FORSTAT	Force Status

FORTRAN	Formula Translation
FSN	Federal Stock Number
FY	Fiscal Year
FSN MDR	FSN Master Data Record
FSR	Force Service Regiment
GSA	General Services Administration
IAS	Immediate Access Storage
IBM	International Business Machines
ICC	Inventory Control Center
ICP	Inventory Control Point
ILS	Integrated Logistics Support
IMSC&D	Item Management Stock Control & Distribution System
I/O	Input/Output
IPG	Issue Priority Group
I^2S	Marine Corps Integrated Information System
JLRB	Joint Logistics Review Board
JSOP	Joint Strategic Objectives Plan
JUMPS	Joint Uniform Military Pay System
LDSRA	Logistics Doctrine Systems and Readiness Agency
LSSC	Logistics Systems Support Center
MACRO	(A Source Language Instruction.)
MACROI	MACRO Instruction
MARES/FORSTAT	Marine Corps Automatic Readiness Evaluation System/Force Status
MATCOM	Materiel Command
MCA	Military Construction, Army
MCO	Marine Corps Order
MCSA	Marine Corps Supply Activity
MDR	Master Data Record
MFO	Master File Organization

MFT	Multiprogramming Fixed Numbered Task
MILS	Military Standard Systems
MILSCAP	Military Standard Contract Administration Procedure
MILSTAAD	Military Standard Activity Address Directory
MILSTAMP	Military Standard Contract Administration Procedures
MILSTEP	Military Supply and Transportation Evaluation Procedures
MILSTRAP	Military Standard Transaction Reporting and Accounting Procedure
MILSTRIP	Military Standard Requisitioning and Issue Procedure
MIS	Management Information System
MISTR	Management of Items Subject to Repair
MMS	Manpower Management System
MOCAS	Mechanization of Contract Administration Services
MORG	Movement Requirements Generator
MOWASP	Mechanization of Warehousing & Shipping Procedures
MRM	Maintenance Reporting and Management
MSTS	Military Sea Transportation Service
MTMTS	Military Traffic Management and Terminal Services
MUMMS	Marine Corps Unified Materiel Management System
MVT	Multi-programming Variable Numbered Task
NAPALM	National ADP Program for AMC Logistics Management
NCR	National Cash Register
NICP	National Inventory Control Point
NMP	National Maintenance Point
OASD	Office of Assistant Secretary of Defense
O/S	Operating System
OSD	Office of the Secretary of Defense
P-A	Personnel and Administration
PCM	Punched-Card Machine
PDS	Priority Distribution System
RCA	Radio Corporation of America

RCS	Reports Control Symbol
RO/ROP	Reorder/Reorder Point
RSA	Remote Storage Activity
SAMMS	Standard Automated Materiel Management System
SASSY	Supported Activities Supply System
SCCFO	Stock Control Center Field Office
SOP	Standard Operating Procedures
SPCC	Ships Parts Control Center
SPEED	System-wide Project for Electronic Equipment at Depots
SPEEDEX	SPEED Extended
SRI	Stanford Research Institute
TAERS	The Army Integrated Equipment Record Maintenance Management System
TASAMS	The Army Supply and Maintenance System
TASCOM	Theater Army Support Command
TDY	Temporary Duty
TEAMUP	Test, Evaluation, Analysis, and Management Uniformity Plan
TOA	Transportation Operating Authorities
TRANSCOM	Transportation Command
UADPS	Uniform Automated Data Processing Systems
UADPS-ICP	Uniform Automated Data Processing System at Inventory Control Points
USAMC	United States Army Materiel Command
USAMC ALMSA	USAMC Automated Logistic Management System Agency
USAMC LSSC	USAMC Logistic Systems Support Center
USAREUR	United States Army, Europe
USARPAC	United States Army, Pacific
USARV	United States Army, Vietnam
USCONARC	United States Continental Army Command
WESTPAC	Western Pacific
3S	Standard Supply System

APPENDIX H

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